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Draft

Environmental Assessment

Swauk Pine Restoration Project

**Cle Elum Ranger District,
Okanogan-Wenatchee National Forest
Kittitas County, Washington**

Sections 17-21 and 29-31, T. 21 N., R. 18 E.;

Sections 23-26 and 35-36, T. 21 N., R. 17 E.; *and*

Sections 1-2, T. 20 N., R. 17 E., *W.M.*

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CHAPTER 1 – PURPOSE AND NEED

Introduction

The Forest Service has prepared this Draft Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This EA discloses the direct, indirect, and cumulative environmental impacts that would result from implementation of the Swauk Pine Restoration Project on the Cle Elum Ranger District of the Okanogan-Wenatchee National Forest.

This is a non-HRFA project (that is, not authorized under the Healthy Forest Restoration Act), subject to the pre-decisional objection process described at 36 CFR 218. Subparts A and B may apply. The Forest Service will provide a formal 30-day comment period, initiated by a Legal Notice of Opportunity to Comment in the Ellensburg Daily Record. Instructions for providing comments will be provided in the Legal Notice, which will also be posted to the Forest website.

Location and Setting

The Swauk Pine Project Area is located approximately 10 miles northeast of the town of Cle Elum in Kittitas County, Washington (Fig. 1). The legal location of the Project Area is as follows:

Sections 17-21 and 29-31, T. 21 N., R. 18 E.;

Sections 23-26 and 35-36 T. 21 N., R. 17 E.; *and*

Sections 1-2, T. 20 N., R. 17 E., *W.M.*

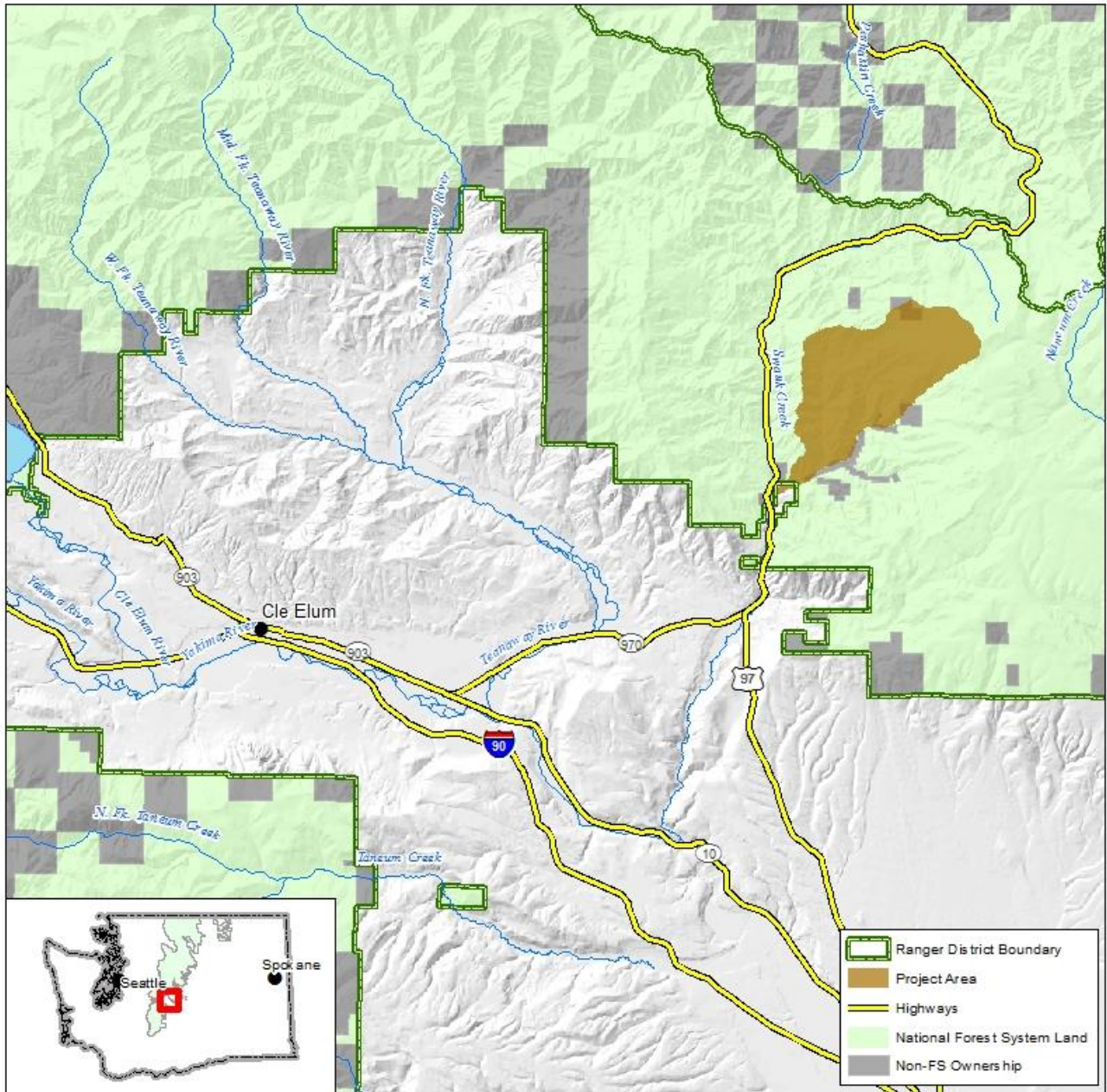
The Swauk Pine planning area is 6483 acres in size. It encompasses 234 acres of private land that will not be treated, and 6242 acres of National Forest System land (Project Area) (Fig. 2). The planning area is bounded on the south and east by Williams Creek, on the north by the ridge between Lion Gulch Creek and Hurley Creek, and on the west by the ridge between Swauk Creek and Lion Gulch Creek.

The Project Area comprises 2% of the Taneum Creek-Yakima River watershed (HUC10 = 1703000105), and 16% of the Upper Swauk Creek subwatershed (HUC12=170300010501). It encompasses all of the Lion Gulch and Cougar Gulch drainages and part of the Williams Creek drainage.

National Forest System land that is within 1.5 mi of private land is characterized as Wildland Urban Interface (WUI) and is a priority area for treatment to reduce the risk of wildfire spread. Two communities, Liberty and the Liberty Mountain Home Area (unincorporated) are located within the Project Area.

The Project Area encompasses part of the Lion Rock Inventoried Roadless Area (IRA) and part of the Lion Rock Proposed Wilderness Area (PWA) (Fig. 3).

The main Forest System roads (FSRs) within the project area include the Lion Gulch Road (FSR 9712000), and the Cougar Gulch Road (FSR 9718000). The paved county road to Liberty and FSR 9705000 (Durst Creek Road) provide the most direct means of access from Highway 97.



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Source: USFS 2016

Swauk Pine Restoration Project Figure 1. Vicinity Map

Okanogan-Wenatchee National Forest
Cle Elum Ranger District
Cle Elum, Washington



0 0.5 1 2 3 4 5 6
Miles

1:200,000

Forest System roads in the planning area total 50.1 miles (40.5 miles open to public use). In addition, there are 9.8 miles of unauthorized road that are not maintained or needed by the Forest Service. Non-system roads (private, county, and BLM roads, public rights-of-way, and non-system roads on National Forest with an authorized use) total 7.2 miles. When all roads are combined (67 miles), the total road density within the planning area is 6.7 mi / sq. mi.

There is year-round dispersed recreation in the Project Area, include camping, hiking, hunting, 4 wheel driving (4WD), horseback riding, and snowmobiling. With 6.4 miles of Forest System jeep trail plus 1.9 miles of Forest System road that is dual use (both road and jeep trail), the Project Area is a popular destination for 4WD enthusiasts. There are also 18 miles of groomed snowmobile trail (FSRs 9712000, 9718000, and 970500). There are no developed campgrounds but dispersed camping occurs along many roads.

There is a long history of timber harvest, gold mining, and domestic livestock grazing within the planning area. Swauk Watershed Analysis (Cle Elum Ranger District 1997, updated 2001, incorporated by reference) provides an overview. The Project Area comprises 14% of the Swauk Sheep Grazing Allotment, and encompasses almost 20% of the approved grazing route (Fig. 4).

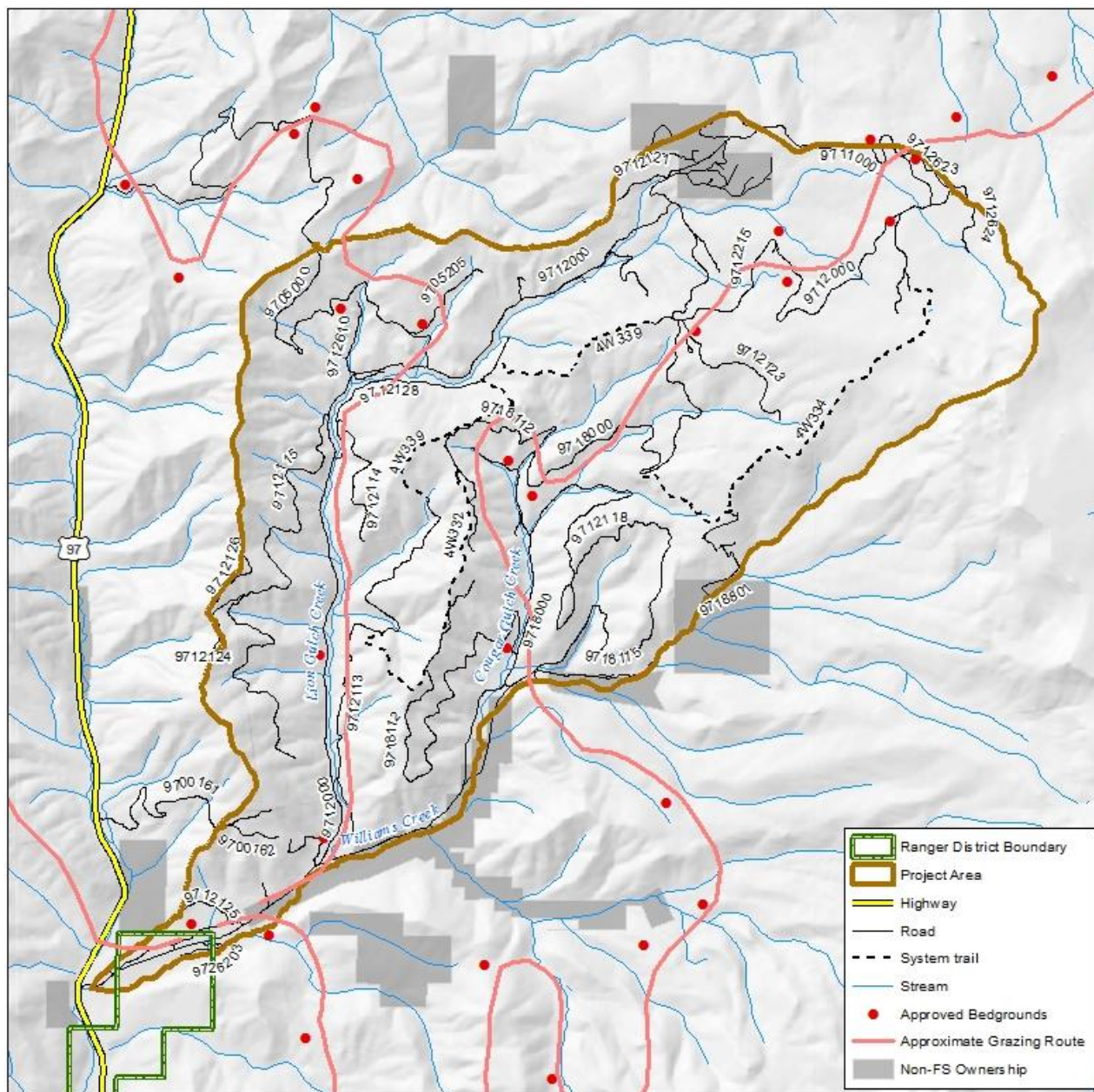
There are approximately 80 active mining claims and 10 active prospecting areas within (or accessed through) the project area. There are 2 approved plans of operation for mining. Six others plans of operations have been submitted and are awaiting approval.

Regulatory Framework

Under the National Forest Management Act (NFMA), all activities on National Forest System land must be consistent with approved Land and Resource Management Plans (LRMPs, or Forest Plans). In order to eliminate repetition and focus on site-specific analysis, this EA tiers to the *Final Environmental Impact Statement (FEIS) for the Wenatchee National Forest Land and Resource Management Plan (USDA 1990, as amended 1994, 2001, and 2005)*. It also tiers to the respective FEISs for the following decisions that amended the Forest Plan:

- Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl (USDA and USDI 1994) (1994 ROD). This decision established the Northwest Forest Plan, laying a new set of land allocations on top of 1990 Forest Plan allocations.
- Pacific Northwest Region Invasive Plant Program Preventing and Managing Invasive Plants Record of Decision (USDA 2005) (2005 ROD).
- Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USDA 2001) (2001 ROD).

Specific areas of tiering are addressed in Chapter 3, by affected resource area.



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Swauk Pine Restoration Project
Figure 4. Sheep Grazing Plan

Okanogan-Wenatchee National Forest
Cle Elum Ranger District
Cle Elum, Washington



Source: USFS 2016

0 0.5 1 Miles

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Forest Plan Direction for the Swauk Pine Project Area

Northwest Forest Plan

Late Successional Reserve (LSR)

Under the Northwest Forest Plan, the entire Project Area is located in the Swauk LSR (Fig. 5). LSRs are managed for creation and maintenance of late successional habitats, including open forest habitat dominated by large old ponderosa pine and Douglas-fir trees, and dense multi-layered forest with a mix of conifer species (principally Douglas-fir and grand fir).

All silvicultural treatments in LSR must be beneficial to the creation and/or maintenance of late successional (old) forest habitat (1994 ROD page 8). Treatments in LSR are also subject to review by the Regional Ecosystem Office (REO), unless specifically exempted based on a previous review (1994 ROD page 49). The Late Successional Reserve and Managed Late Successional Area Assessment Wenatchee National Forest (Forest Service 1996, Revised 1997) (LSRA) was reviewed and found by REO to provide an acceptable framework for silvicultural treatments in LSRs on this Forest. Treatments that are consistent with the LSRA require no additional review by REO.

The LSRA outlines treatment strategies in LSR to reduce risk of catastrophic wildfires. It classifies Swauk LSR as a Source LSR, designed to support a self-sustaining population of northern spotted owls. In source LSRs, the LSRA requires retention of habitat around all occupied spotted owl sites (500 acres within 0.7 miles).

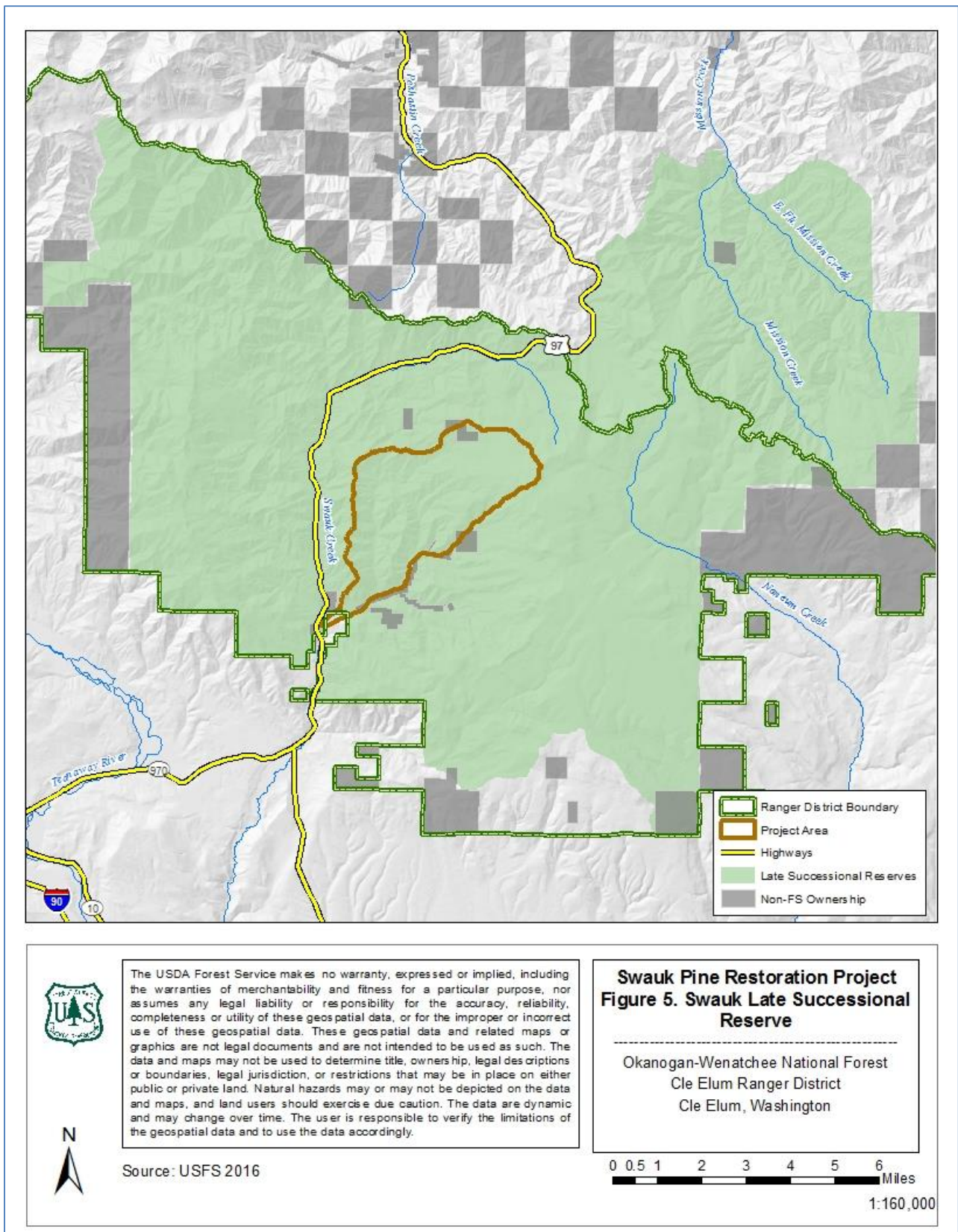
Spotted owls were recently proposed for uplisting from threatened to endangered status, under the Endangered Species Act (ESA). The entire Swauk Pine Project Area (and most of Swauk LSR) is also designated as critical habitat for spotted owl (USDI 2012). LSR direction, LSRA guidance, and the Final Revised Spotted Owl Recovery Plan (USDI 2011) all informed the design of this project.

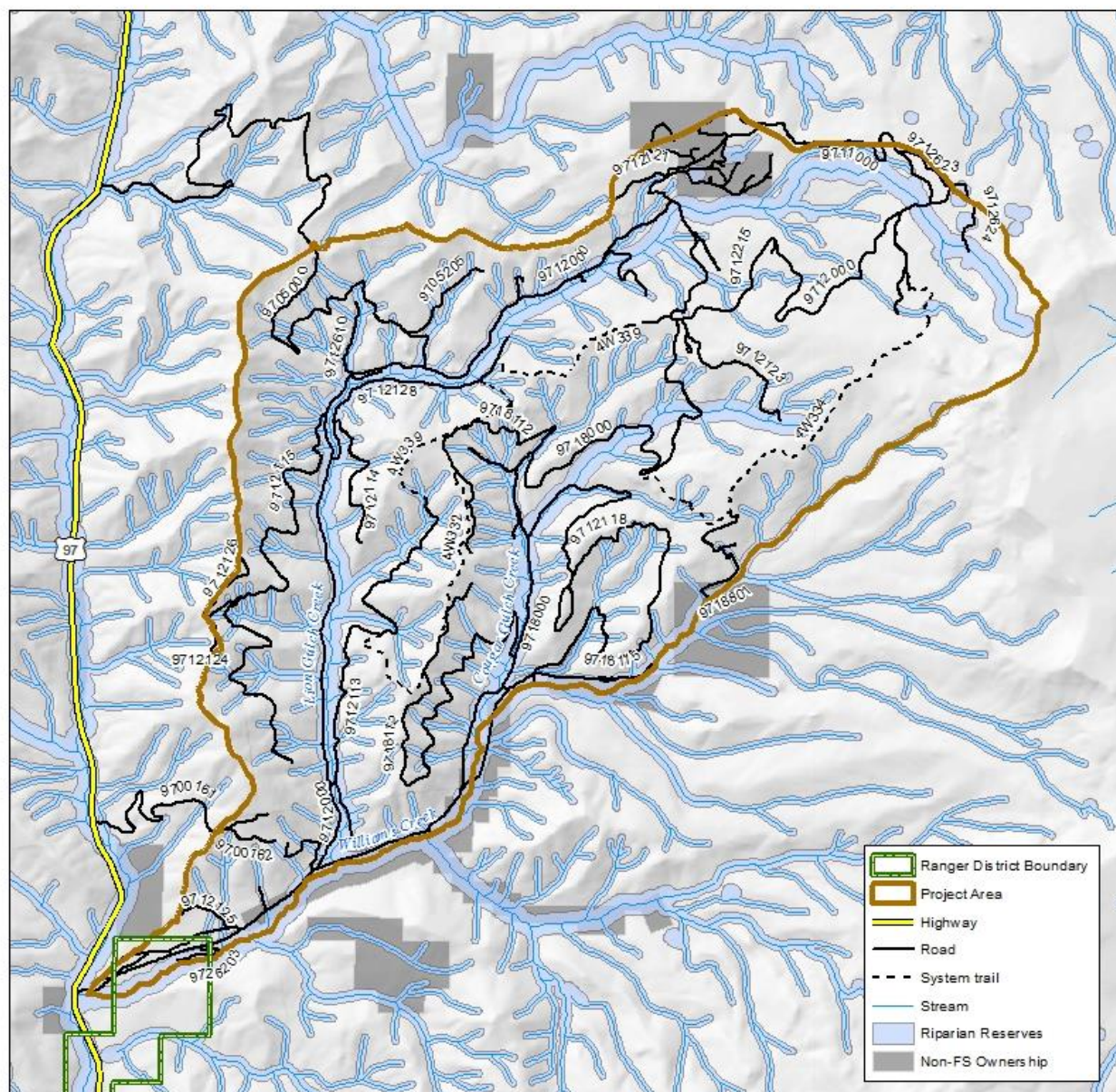
Riparian Reserves

The Project Area encompasses approximately 2104 acres of *Riparian Reserve* (areas around streams, wetlands, ponds, lakes, and other unstable or potentially unstable areas) (Table 1.1. and Fig. 6.). Riparian Reserves are a cornerstone of the Aquatic Conservation Strategy (ACS) (1994 ROD pp. 7). In Riparian Reserves, management emphasis is on the protection of riparian dependent resources and riparian functions. Management activities within Riparian Reserves may not retard attainment of 9 ACS objectives listed in the 1994 ROD (pp. B-11).

Table 1.1. Type and amount of Riparian Reserve in Upper Swauk Subwatershed and the Swauk Pine Project Area.

NWFP Riparian Reserve Buffer Type	Acres in Upper Swauk (HUC12)	Acres in Swauk Pine Project Area
Wetlands (100-150 feet)	90	20
Intermittent streams (100 feet)	7666	1188
Fish-bearing streams (300 feet)	2847	885
Perennial non fish-bearing streams (150 feet)	16	12
Total	10,619	2104





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Source: USFS 2016

Swauk Pine Restoration Project
Figure 6. Riparian Reserves

Okanogan-Wenatchee National Forest
Cle Elum Ranger District
Cle Elum, Washington

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Wenatchee National Forest Land and Resource Management Plan (1990 Forest Plan)

The Swauk Pine planning area encompasses 4 mapped management allocations under the 1990 Forest Plan (Fig. 7). General Forest has been superseded by LSR designation under the Northwest Forest Plan. Three allocations, Scenic Travel-Retention, Scenic Travel-Partial Retention, and Motorized Unroaded, are still applicable to the project. Scenic Travel areas are managed to retain or enhance the viewing and recreation experiences along scenic travel routes.

The 1990 Forest Plan also provides general management direction for unmapped Riparian Management Areas (RMAs) around streams, ponds, and wetlands. The direction is to favor riparian dependent resources in RMAs.

Where conflicts arise, standards and guidelines from the Northwest Forest Plan supersede those of the 1990 Forest Plan unless the 1990 Forest Plan is more restrictive, or provides a greater benefit to late successional species (1994 ROD pp. A-2).

Other Laws, Regulations, and Policies

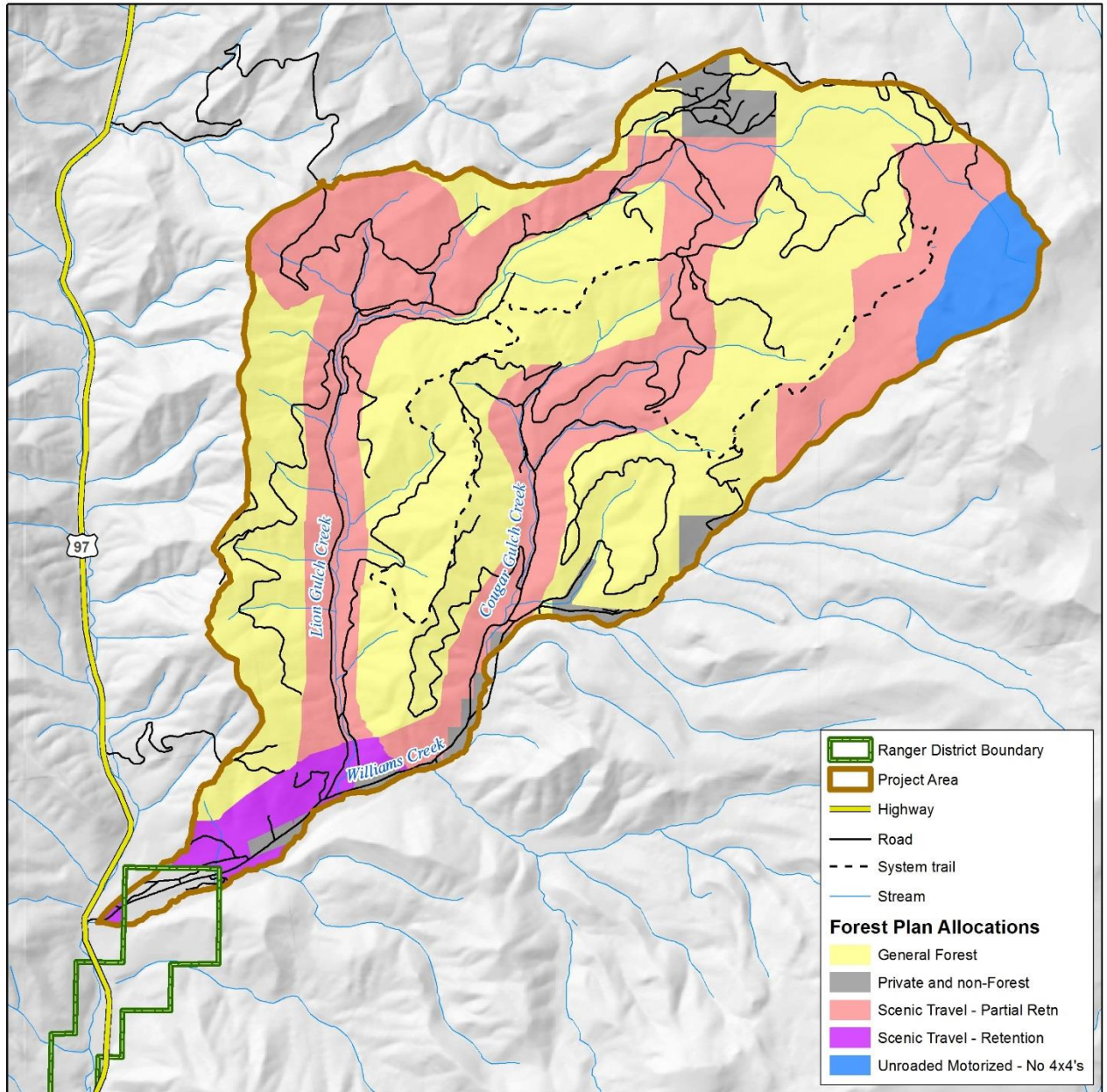
In addition to NEPA and NFMA, the following laws were considered during planning of this project. Each law's relevance to the project is explained in Chapter 3 (sections indicated in parentheses).

- Clean Water Act (Hydrology)
- Clean Air Act (Fuels)
- Endangered Species Act (Botanical, Wildlife, and Aquatic Species)
- Magnuson-Stevenson Act (Aquatic Species)
- National Historic Preservation Act (Cultural Resources)
- USDA Departmental Regulations DR 9500-3 Prime farm, range, park and forest lands (Required Disclosures);
- Public Law 111-11 (Chapter 2 – Purpose and Need)
- Executive Orders (EOs) 11988 Floodplains and 11990 Wetlands (Hydrology);
- EO 13186 Migratory Landbirds and the Migratory Bird Treaty Act (Wildlife)
- EO 12898 Environmental Justice (Required Disclosures)
- 40 CFR 1502.16(e) Potential or unusual expenditures of energy (Required Disclosures)
- Forest Service National Strategic Framework for Invasive Species Management (August 2013) (Botanical Species)

The project is also designed to conform to the following Forest Policies (incorporated by reference):

- *Okanogan-Wenatchee Forest Restoration Strategy* (Restoration Strategy) (Okanogan-Wenatchee National Forest, November 2012). The strategy requires a landscape level assessment to determine how the landscape has changed over time, and which departures from historic conditions can be addressed through treatments. The underlying premise of the Forest Restoration Strategy is that a landscape is more resilient¹ to all forms of disturbance, if current conditions are within or close to the historic range of variation (HRV).

¹ Resilience is defined [in the 2012 Restoration Strategy page 116] as, “the capacity of an ecosystem to tolerate disturbance without collapsing into a qualitatively different state that is controlled by a different set of processes. A resilient ecosystem can withstand shocks and rebuild itself when necessary” (Walker et al. 2004).



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Source: USFS 2016



Swauk Pine Restoration Project Figure 7. 1990 Forest Plan Allocations

Okanogan-Wenatchee National Forest
Cle Elum Ranger District
Cle Elum, Washington

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Miles

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- *Retention of Large and Old Trees (Letter of Direction dated June 17, 2010)*. The policy is to provide for large and old tree retention within the HRV for each forest types, as specified in the Restoration Strategy.
- *Okanogan-Wenatchee Forest Roads Policy (Letter of Direction dated December 5, 2013)*. The policy requires that every Integrated Vegetation Management project consider roads that are or have a potential to adversely impact natural processes. The focus is on problem road segments or segments where aquatic restoration objectives can be met. For each project, a decision will be made to improve, decommission, or close at least 10% of the system roads (higher than 10% for roads in key watersheds and/or where water quality is impaired).

Project Record

The Swauk Pine Project Record includes Specialist Reports pertaining to Soils, Hydrology and Water Quality, Silviculture (Forest Vegetation, Fuels and Fire), Fire Suppression and Air Quality, Botany (Rare and Invasive Botanical Species), Wildlife, Aquatic Species, Transportation System, Recreation, Range, Cultural Resources, and Scenery. This EA incorporates by reference the entire Project Record (40 CFR 1502.21), including all Specialist Reports and other technical documentation used to support the analysis and conclusions in this EA. The Project Record is located at the Cle Elum Ranger Station in Cle Elum, Washington.

Chapter 3 summarizes the various Specialist Reports, providing enough site-specific information to demonstrate a hard look at the environmental impacts of the project and how these impacts can be mitigated, without repeating detailed analysis and background information available elsewhere in the Project Record.

The following supporting analyses are also incorporated by reference in Specialist Reports:

- *Swauk Creek Watershed Analysis* (Cle Elum RD 2005). Watershed Analysis is a systematic process for characterizing the aquatic, riparian, and terrestrial features within a watershed. It is a key component of the Aquatic Conservation Strategy (1994 ROD pp. 10). Road management was listed as the single most important remedial action for improving hydrologic functions and fish and wildlife habitat, in this watershed.
- *Okanogan and Wenatchee National Forest Roads Analysis* (March 2004): This interdisciplinary analysis addressed Maintenance Level (ML) 3, 4, and 5 roads at the sub-basin scale. It rated the effects of roads on biological, physical, and social resources, and assigned each road a priority rating for keeping and maintaining or improving the road. The resulting recommendations informed the proposed road actions for this Project.
- *Travel Analysis Report for the Swauk Pine Project Area* (Cle Elum RD 2014). In January of 2009, Forest Service Manual (FSM) direction for management of the transportation system (FSM 7710) was amended. Instead of Roads Analysis, a more streamlined process called Travel Analysis was adopted as a requirement for decisions affecting the road and trail system, use of roads and trails, and access to National Forest System lands. Travel Analysis is an interdisciplinary process, and for this Project it entailed expanding the 2004 Roads Analysis to include ML1 and ML2 roads in the Swauk Pine planning area. Risk ratings and recommendations resulting from Travel Analysis are summarized in Appendix A.

To support the Swauk Pine planning process, all roads in the planning area were mapped in the field with global positioning equipment, to ensure accurate mapping and classification of roads.

Purpose and Need for Action

The primary purpose of the Swauk Pine Project is two-fold:

1. Improve resilience to wildfires and other disturbances by returning the forested landscape to a state that is within or closer to the historic range of variability (HRV), and
2. Improve the resilience and function of aquatic systems that have been degraded by previous and ongoing human actions (harvest, mining, road construction, and dispersed recreation).

Background Information

Current Condition of Forest Vegetation

In 2013, in accordance with the Forest Restoration Strategy, a landscape level assessment was completed for a 13,500-acre area encompassing Lion Gulch, Cougar Gulch, and the Williams Creek and Boulder Creek drainages. This area is distinguished from the rest of Swauk Creek watershed by less rainfall and higher average elevation. The evaluation began with aerial photo interpretation to describe current forest structure, composition, amounts, and arrangement across the landscape. Then a software tool called Ecosystem Management Decision Support (EMDS) was used to describe other attributes that are derived from vegetation (such as potential for running crown fire, risk of insect and disease outbreak and spread, and the amounts and arrangement of different kinds of wildlife habitat). Each variable was then compared to a historical reference condition, in a process called departure analysis.

Departure analysis for the Swauk Pine landscape revealed that the percentage of landscape in one forest structure class, young forest multi-story or YFMS, is currently 41%. This level is well above the historic range of variability (HRV). These are stands with a high density of small trees below larger older trees, a condition that develops in the absence of disturbance.

Two other key forest metrics, patch size and patch density, are also highly departed from HRV. Patch sizes have become much smaller, and there are many more patches across the landscape today than existed historically. Lack of disturbance (allowing ingrowth of trees and accumulation of fuels in formerly open stands), and previous harvest practices (for example, clear-cuts that bisected dense stands) both contributed to these departures. As a result, there is now a much higher amount of edge across the landscape.

Because patches are much closer together, there is also a higher likelihood of fire spread from patch to patch.

Because the entire Swauk Pine landscape falls within a source LSR and within designated critical habitat for spotted owl, spotted owl habitat was also considered during departure analysis. The total amount of spotted owl habitat is currently within HRV, albeit near the high end of the range, but its arrangement on the landscape is highly departed. There are too many small patches of owl habitat, too close together. Much of it occurs as YMFS located on dry steep slopes that are likely to burn. There is high potential for fire to spread into and out of existing high value spotted owl habitat, due to running crown fire (when fire spreads rapidly through the canopy of trees, rather than on the ground).

Desired Future Condition for Forest Vegetation

After evaluating all the ways that the Swauk Pine landscape has departed from HRV, and modeling various ways to provide high value spotted owl habitat in sustainable locations (to support spotted owl recovery), the IDT arrived at a desired future condition (DFC) for the Swauk Pine planning area (Fig. 8). The DFC has fewer but larger patches of both dense and open old forest, and less overall edge. Dense old multi-story forest (OFMS) that provides high quality spotted owl habitat occurs on northerly slopes and valley bottoms (natural fire refugia described by Camp (1995)). Open forest dominated by large old ponderosa pine (Old Forest Single Story, or OFSS), occupies the steepest driest slopes. Some strategically located patches of moderate canopy forest help link dense forest patches across the landscape. If a fire occurs and the need arises to replace spotted owl habitat, these moderate canopy areas would be capable of providing habitat in a relatively short amount of time (2 to 3 decades, instead of 6 or 8).

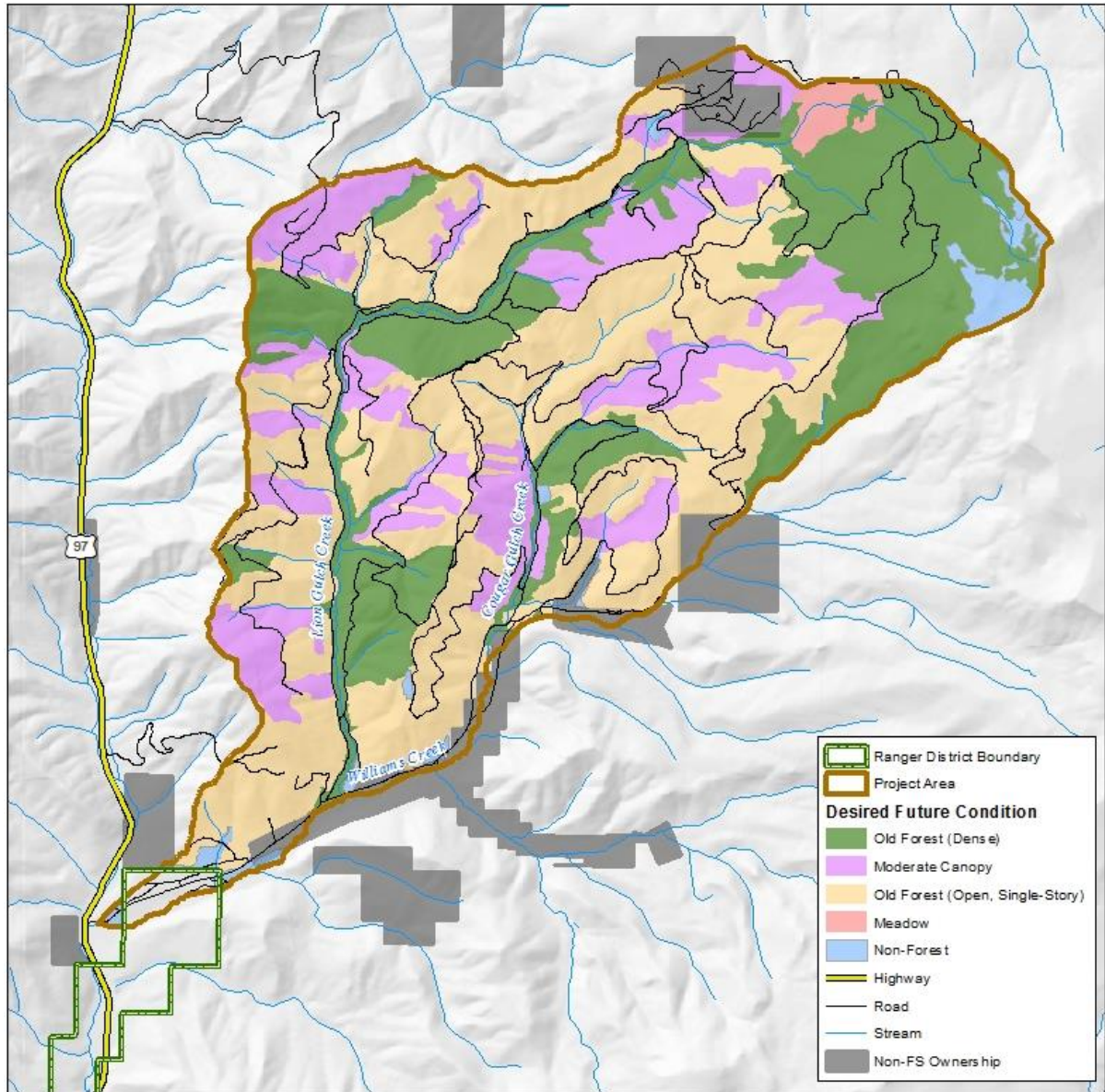
The desired forest mosaic would result in (and be sustained by) a mixed severity fire regime. Individual stands or patches may change but the types, structure, and age classes of stands *across the landscape* would remain relatively constant over time.

Need for Vegetation Treatments

Based on current versus desired landscape conditions, the following actions are needed to restore the landscape to a more resilient condition: reduce overall YFMS, create fewer but larger patches of both open and dense old forest with less overall edge, restore contiguous blocks of dense old forest in areas where it would be most likely to persist (natural fire refugia), and establish fuelbreaks around dense old forest.

From these needs, vegetation treatments were designed to meet the following silvicultural objectives:

- Interrupt fire flow paths (that is, create fuelbreaks) to better protect areas of moist late successional forest, including current and future spotted owl habitat;
- Protect and conserve existing high value spotted owl habitat, and culture old forest multi-story (OFMS, that is, future high value habitat) on northerly slopes and valley bottoms;
- Reduce the over-abundance of small diameter dense forest (YFMS), and culture larger patches of open forest dominated by large old ponderosa pine (OFSS), particularly on upper and southerly slopes;
- Increase the distance between patches with moderate and high running crown fire risk by thinning;
- Restore ecological processes dependent on fire and help re-establish a mixed severity fire regime, by reintroducing fire.
 - Where appropriate, conduct maintenance burns in areas burned by wildfire in 2012, targeting only those stands with a DFC of old forest single-story (OFSS);
 - Regenerate declining aspen stands on the north side of Dunning Meadow, using prescribed fire;
- Maintain fine-scale (within stand) structural diversity using variable density thinning techniques and retention of clumps and gaps;
- Retain all old trees as defined by Van Pelt (2008), and additional large trees as needed to meet or exceed current policy described in the 2012 Restoration Strategy;
- Provide forest products where ecologically appropriate and feasible. The project is located in the Tapash Collaborative Forest Landscape Restoration (CFLR) Area—designated by the Secretary of Agriculture as a priority landscape for restoration. Under Public Law 111-11 (2009), priority



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Source: USFS 2016

Swauk Pine Restoration Project Figure 8. Desired Future Condition

Okanogan-Wenatchee National Forest
Cle Elum Ranger District
Cle Elum, Washington



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Miles

1:45,000

landscapes may receive federal funds for ecological restoration treatments that encourage the use of forest restoration byproducts that can offset treatment costs while benefitting local economies and improving forest health (Section 4001 (4) (B)). The federal CLFR Program encourages forest restoration that provides for ecological, economic, and social sustainability, leverages local resources with national and private resources, and reduces wildfire management costs.

Current Condition of Aquatic Systems

Watershed condition was also evaluated at a landscape scale. Assessment of current conditions was based on inventories throughout Swauk Creek watershed, and modeling of cumulative impacts at the watershed scale. Currently, the watershed is in a highly degraded condition for aquatic resources, due to previous vegetation management practices, roads and trails (both system and unauthorized), and ground-disturbing activities within Riparian Reserves.

At the project scale, the IDT identified multiple locations where roads and/or old railroad beds impinge upon floodplains (limiting channel migration, and/or intercepting and rerouting water in a manner that impedes shallow ground water storage in floodplains – the dewatered meadow adjacent to FSR 9718000 in Cougar Gulch is a prime example). The IDT also identified multiple sites where road design, culvert placement, and/or lack of maintenance is creating barriers to fish passage or affecting water quality by delivering sediment laden water from road ditches and road surfaces directly to stream crossings. This affects water quality, fish, and aquatic habitat diversity. These kinds of problems are only likely to worsen given declining Forest Service road maintenance budgets, and increasingly deferred maintenance on many roads. There is increased risk of slope failure, surface erosion, gullying, and landslides.

Many other problems were documented. FSR 9712113 between Lion Gulch Creek and 4W 332 is exhibiting mass wasting. Road failures and streams captured on road surfaces delivered large amounts of sediment into Lion Gulch Creek. The road is currently under an emergency closure order, but recent unauthorized use culminated with motorized travel up the middle of the stream channel to a riparian meadow on the opposite side. Streambanks and riparian soils and vegetation were physically damaged by off-road travel in the channel and meadow, causing further erosion and damage to Lion Gulch Creek.

The current condition of the aquatic ecosystem can be attributed to the effects of previous road construction, timber harvest, mining, motorized trail construction, and more recently, dispersed recreation. Past activities have all contributed to landscape scale disturbance, including removal of large woody debris (LWD) from streams and floodplains, and removal of large standing trees that are sources for future recruitment of LWD. Tree removal has resulted in loss of shade over water, and impaired water quality (water temperature) under the Clean Water Act. Soil compaction has impaired hydrologic processes within Riparian Reserves. Floodplain and channel alterations have degraded conditions in stream channels, floodplains, and shallow aquifers.

Several heavily-used dispersed campsites in the Riparian Reserve of Lion Gulch appear to be expanding every year, causing soil compaction, loss of ground cover, and loss of understory vegetation and overstory trees within Riparian Reserves. Previous attempts to confine use at these sites have failed – users have removed embedded boulders and expanded the footprint of disturbance. User-built trails extend from some sites, crossing streams to access closed roads and unauthorized trails and trails.

Unauthorized hill-climbs are problematic near the junction of 4W 339 and 332, where at least 6 hill-climbs totaling more than one mile and a segment of 4W 339 all converge to deliver snowmelt and stormwater

runoff with sediment laden water directly to a stream crossing. Two new hill-climbs developed during this planning effort. Severe downcutting is occurring below the crossing. The system jeep trail is steep and straight, has eroded down to bedrock, and channels water for hundreds of feet directly to the stream, an unnamed tributary to Lion Gulch Creek.

Two parallel segments of 4W 339 between the ridge and Riparian Reserve of Lion Gulch Creek are in a similar condition. Both are steep and deeply rutted, and drain sediment-laded water into the Reserve.

Desired Future Condition for Aquatic Resources

The desired future conditions for Aquatic Resources in the Swauk Planning Area have changed little from those identified in previous watershed analyses (1997, updated 2005). They include:

- Low gradient stream channels with wide floodplains (such as lower Cougar Gulch Creek) have meandering side- and main channels that provide fall, winter, and spring high water flow refugia for fish. Their sinuous character, in combination with other energy dissipation components (large wood in channels and floodplains) helps dissipate the energy of floodwaters;
- Streams with south and west aspects (including Lion Gulch, Cougar Gulch and Williams Creeks) retain sufficient riparian vegetation comprised of both conifer and hardwood species to provide summer and winter thermal buffers. Streams are no longer included in DOE's Sec.3 D listing for impaired water quality to due to temperature;
- Riparian Reserves retain large trees that serve as continuous sources of recruitment for large down logs in floodplains and channels.
- All culverts are adequately sized and positioned to pass at least 100-year flow with associated debris (without concentrating flow or velocity). No culverts pose a barrier to fish passage. Roads do not intercept and reroute surface and groundwater flows.
- Closed roads have self-maintaining drainage design that does not allow water to pool on their surface. ML-2 roads with gates are not used after fall rains begin, or in early spring.
- Unauthorized roads and trails, including hill climbs are decommissioned and sufficiently restored so that they do not concentrate runoff or contribute to soil erosion, and do not attract use. Enough native vegetation is established to discourage establishment and spread of invasive species.
- Dispersed camping areas in Riparian Reserves have healthy over- and understory vegetation, with sufficient quantity and size of organic material (everything from fine litter to large woody debris) to sustain soil and site productivity. Where necessary, dispersed use is confined to an acceptable footprint to ensure that the majority of the Reserve is functioning as intended;
- Mature conifers are retained around seeps, springs, bedrock hollows, and areas prone to slumping. Roads do not cross immediately above, below, or through these features.
- Thinned stands on south and west slopes retain clumps of trees with canopy closures of 40 to 60%, for snowpack retention.
- Upland soils are not compacted, and retain fine and coarse organic material that improves moisture retention.

Restoration Needs for Aquatic Resources

Based on existing versus desired conditions, there is a need here for a smaller transportation system (commensurate with the road maintenance budget) that does not impair water quality or impede natural hydrologic processes.

Sediment inputs are well outside of desired levels identified in the desired future condition. There is a need for reduced sediment delivery from system roads and jeep trails, unauthorized roads and trails, and dispersed camping areas in Riparian Reserves

The amount of large woody debris in channels and floodplains is below desirable levels identified in the DFC. There is a need here for more LWD in all streams and floodplains, to support natural channel migration and floodplain processes.

Thermal regimes have been compromised by removal of shade over water, road construction adjacent to streams, and impaired groundwater storage due to roads and soil compaction within Riparian Reserves. There is a need for increased shade over water and improved riparian ground water storage that supports late summer base flows.

Based on these needs, aquatic restoration objectives are to:

- Reduce total amount of roadbed within Riparian Reserve;
- Remove man-made impingements to surface and subsurface flows;
- Restore large wood in existing channels to dissipate flood energy while accommodating the volume of water and debris within the existing floodprone width (that is, maintain the natural sediment and flow regimes);
- In areas where streams have downcut, raise streambed elevations by 1 to 3+ feet over current elevations;
- Increase flood stage and frequency of floodplain inundation during 2 to 10 year flood events;
- Engage side channels and floodprone areas in the valley bottom with overbank flood discharges;
- Restore shallow groundwater recharge within riparian areas by decompacting soils;
- Restore thermal regime where cooler shallow groundwater returns to the channel;
- Restore channel habitat complexity with increased pool formation and cover habitat;
- Restore riparian vegetation, including cottonwood communities, through restoration of floodplain processes.
- Remove barriers to aquatic organism (fish) passage at road stream crossings.

Overview of the Proposed Action ---

Vegetation Treatments

To meet purpose and need and move the Project Area towards the desired future landscape condition, the Forest Service proposes vegetation treatments totaling 4,947 acres (Table 1.2 below, and Figure 9 in Chapter 2). A detailed description of each treatment is found in Chapter 2.

The proposed action also includes experimental study of the effects of different commercial thinning intensities and levels of down wood retention on the small mammal prey of spotted owls (Prey Base Study).

The prescribed fire acreage in Table 1.2 also includes maintenance burning in the Lion Rock Potential Wilderness Area (x acres) and Lion Rock Inventoried Roadless Area (x acres). Most of the acreage targeted for treatment burned during the Table Mountain Wildfire of 2012, and all of it has a desired future condition of Old Forest Single Story.

Table 1.2. Overview of proposed vegetation treatments for the Swauk Pine Restoration Project (acres of treatment, and percent of Project Area treated), with connected actions (if any).

Treatment	Connected Actions	Acres	<i>Percent of Project Area</i>
Commercial thinning and treatment of activity fuels. Both ground-based and skyline logging systems would be utilized.	<ul style="list-style-type: none"> • Construction and use of temporary roads (all would be decommissioned after harvest); • Construction of one new specified road for timber haul; this road would be converted to system jeep trail after harvest; • Relocation of one open system road; • Reconstruction and use of open and closed system roads for timber haul; • Danger tree management along haul routes; • Invasive plant treatments on landings, skidtrails, and haul routes 	1327	21
Non-commercial hand thinning in a plantation; cut trees would be hand-piled and burned.	<ul style="list-style-type: none"> • Planting to improve species mix. 	21	<1
Non-commercial thinning with a masticator	<ul style="list-style-type: none"> • Planting to improve species mix. 	90	1
Thinning with prescribed fire (natural fuels underburn and/or maintenance burn).	<ul style="list-style-type: none"> • Hand line construction 	2756	45
Legacy tree protection		509	8
Riparian large wood replenishment		226	3
Aspen regeneration with prescribed fire	<ul style="list-style-type: none"> • Construction of fence to exclude deer, elk, and domestic sheep from regenerating aspen, for at least 10 years after treatment. Fence would be constructed around one or more clones. 	18	<1
All treatments		4947	80
No Treatment (areas at or near DFC, or control areas for experimental prey base study).		1250	20

Aquatic Restoration Actions

To meet purpose and need and move the Project Area towards the desired future condition for aquatic resources, the Forest Service proposes treatment of vegetation and roads as summarized in Table 1.3. Site-specific aquatic restoration actions are planned at 59 locations (Figure 12 in Chapter 2; see Appendix C for a description of planned actions at each site).

Table 1.3. Aquatic restoration treatments summary.

Restoration Category	Actions	Miles/Acres Restored
Riparian Restoration	Modify use patterns at 5 dispersed recreation sites within riparian areas and restore riparian soils and vegetation.	5 acres
	Large wood replenishment in streams and floodplains to restore channel condition and aquatic habitat over 8 miles of stream.	226 acres
	Redesign roads located adjacent to or crossing streams, wetlands, and groundwater seepage areas to restore natural flow paths and streambed elevations in wet meadows and floodplains.	1 acre
Stream Channel/aquatic habitat restoration	Remove fill associated with skidtrails and old railroad beds (4 sites in Lion Gulch) and unauthorized dams and diversions (3 sites in Cougar Gulch) which are barriers to overbank flood dispersion.	0.5 miles
	Add large wood to streams and floodplains (16 sites in Lion Gulch, Cougar Gulch, Billy Goat Gulch, and William Creek drainages) to restore channel condition and aquatic habitat.	8.5 miles
Restoring Aquatic Organism Passage (AOP) in streams	Replace stream crossing culverts or modify existing crossings to provide for fish and aquatic species passage (14 upgrades).	4.5 miles
Road / Trail actions for Riparian and Aquatic Habitat Restoration	Reduce road/motorized trails miles affecting hydrology and aquatic habitats by:	
	<ul style="list-style-type: none"> • Installing effective road closures; 	0.9 miles/16 acres
	<ul style="list-style-type: none"> • Decommissioning roads and trails in riparian areas (system and unauthorized) to restore wetland, stream and floodplain functions; 	9.8 miles/178 acres
	<ul style="list-style-type: none"> • Road and 4WD Trail stormproofing, reconstruction, and relocation to eliminate sediment and hydrology impacts. 	1.6 miles/30 acres

Specific road and trail actions include:

- Relocate one section of open system road (FSR 9718112) outside of the Riparian Reserve;
- Relocate 3 segments of system jeep trail (4W 339) outside of Riparian Reserve;
- Decommission unauthorized trail (including hill-climbs) totaling 3.7 mi.
- Convert a 1.1-mi section of FSR 9712113 that is currently designated as dual use road/trail, to system jeep trail (4W 332). The intent is to reduce the road maintenance cost while maintaining a popular 4X4 loop opportunity;
- Close 0.9 miles of open system road;
- Decommission 0.9 miles of open road and 5.2 miles of closed road;
- Decommission all unauthorized roads (approximately 9.7 miles, total) (Fig. 14 in Chapter 2).

Proposed closure and decommissioning of system roads was informed by Travel Analysis (Appendix A). Although not required for Travel Analysis, the IDT considered and rated the known risks and uses of unauthorized roads and trails, and determined that retention of unauthorized roads would not meet purpose and need (Fig. 14).

Decision Framework

District Ranger Michelle Capp of the Cle Elum Ranger District is the Responsible Official for this project, and will make the following decisions based on the interdisciplinary analysis documented in this EA:

- Whether to implement the Proposed Action as written or modified;
- What mitigation measures will be implemented with this project;
- What if any monitoring will be implemented for this project.

Public Involvement and Consultation

Collaborative Groups

Three collaboratives have engaged in or been kept informed about the project since its inception in 2012. Prior to development of a proposed action, the Interdisciplinary Team met twice in the field with members of the Swauk Pine Collaborative Group. Non-Forest Service participants included 2 pre-sale foresters with the Yakama Nation, a wildlife biologist with the Yakama Nation, 3 representatives from timber industry, Conservation Northwest, and National Marine Fisheries Service. Discussions focused on departure analysis, tradeoffs associated with retention of large trees, strategies for completing aquatic restoration work and non-commercial treatments, and large wood and replenishment in degraded stream systems.

Other organizations received early updates about the project, including the Upper Yakima Watershed Action Group, Mid-Columbia Fisheries Enhancement Group, the Tapash Collaborative, and Kittitas Conservation Trust.

Consultation with American Indian Tribal Governments

Letters describing the proposed action were mailed on March 27, 2014 to tribal governments of the Yakama Indian Nation and the Confederated Tribes of the Colville Indian Reservation. There was no response to the letters.

Consultations with Federal and State Agencies

Pursuant to the Endangered Species Act, the District met early with the U.S. Fish and Wildlife Service (FWS) to discuss departures from historic conditions, the desired future landscape condition, the proposed action, LSR standards and guidelines, recovery needs for spotted owl, and updates to the environmental baseline for spotted owls due to the Table Mountain Wildfire of 2012. A scoping notice was mailed to FWS on March 28, 2014, and FWS responded with written scoping comments. Informal and formal section 7 consultation with FWS is required for this project, and will be completed prior to the Final Decision.

A scoping notice was also sent on March 28, 2014 to the National Marine Fisheries Service (NMFS), and NMFS responded with written scoping comments. A biologist with NMFS met in the field with the Project Fisheries Biologist, to review the Proposed Action. The District will consult with NMFS regarding potential

effects to Mid-Columbia steelhead and Essential Fish Habitat (EFH). Consultation will be completed prior to a Final Decision for the project.

Discussions with County Commissioners and County Agencies

A scoping notice was sent on March 28, 2014 to Kittitas County Commissioners. Former District Rangers Judy Hallisey and Ranger Mary Maj met with County Commissioners in 2014 and 2015, respectively, to discuss proposed road closures.

In 2014, District Fire Management Officer Michael Starkovich met with a Rural County Fire Department to discuss proposed vegetation treatments, and the process used to identify roads proposed for closure.

Public Outreach

The project has been listed on the Okanogan-Wenatchee Schedule of Proposed Action since March 28, 2014. On that date, a scoping letter was posted to the Forest website, and scoping notices were mailed to 670 individuals and agencies on the Cle Elum Ranger District Project Mailing list or property owners within 1 mile of the Project Area, as identified on county tax roles in December 2012. The scoping period ended on May 1, 2014.

Issues

During the scoping period, 67 individuals or organizations submitted written comments about the project. A petition with 348 signatures was also submitted.

All comments were reviewed by the IDT (Appendix B). Issues and concerns were characterized as follows:

- Non-issue (already decided by law, regulation, the Forest Plan or higher level decision, beyond the scope of the project, not relevant to the project, or conjectural--not supported by scientific or factual evidence);
- a concern that can be mitigated with a minor change to the proposed action, such as adding a required mitigation;
- a concern or question arising from missing, erroneous, or unclear information in the scoping letter;
- an unresolved conflict that would be addressed by considering an alternative to the proposed action.

Concerns fell into 6 major categories, as follows:

1. Access: Proposed road and trail actions would affect many types of public use, including driving, mining, hunting, 4WD trail use, dispersed camping, mushroom collection, and winter recreation.

IDT Response: Several letters (and the petition) objected to any changes to the road system—the No Action alternative responds to this concern. Others suggested alternatives, such as closing roads instead of decommissioning them, just fixing them, or converting more roads to trails. Alternatives were considered and then eliminated from detailed study, primarily because they didn't address underlying resource damage or the need to reduce the size of the road system to a manageable level, commensurate with budgets. See further discussion in Chapter 2.

2. Effects to Water quality, water quantity, and fish habitat:
 - Proposed management actions may affect stream temperatures in 303d impaired streams.
 - Adding large wood to streams may result in downstream flooding or erosion.

IDT Response: Consistency with the Clean Water Act is required. Effects to water temperature are analyzed under Hydrology in Chapter 3. The second concern is conjectural. Effects of large wood replenishment are addressed in Chapter 3.

3. Effects to Wildlife:

- Proposed actions may result in disturbance to deer and elk, loss of security habitat for gray wolves, and core area for grizzly bears in the North Cascades Grizzly Bear Recovery Zone.
- Treatments may result in adverse effects to spotted owls and their designated critical habitat, and also incidental take of spotted owls.

IDT Response: A “No Take” alternative and an alternative with slightly more impacts to spotted owl habitat were considered and eliminated from detailed study (See Chapter 2). Effects to wildlife are summarized in Chapter 3.

4. Concerns about Vegetation Treatments:

- Treatments may impede permittee’s use of the Swauk Sheep Allotment;
- Describe impacts to unique habitats;
- Consider an alternative that maximizes the economic benefit to the local community (treat more acres, maintain more roads for more efficient management of the forest, harvest some large trees to increase timber sale value; protection of legacy trees is too costly);
- Retaining all large trees may conflict with need to improve vigor of remaining trees;
- Protect large trees during burning;
- Treatments will result in a tree farm;
- Commercial thinning will not achieve project goals;
- Commercial thinning in Potential Wilderness Area may affect wilderness characteristics, and eligibility for wilderness consideration.

IDT Response: Required mitigations were added to reduce impacts to the permittee, to preserve fine scale diversity in treated stands (so they don’t resemble tree farms), and to minimize loss of large trees during burning. A burn only alternative was considered but eliminated from detailed study (See Chapter 2). Impacts to one unique habitat (aspen) are described in Chapter 3. Large tree retention is mandated by Forest policy and is part of the project purpose and need. Long-term vegetation management needs were evaluated during Travel Analysis, which informed the proposed road actions.

The purpose and need for the project is driven by ecological needs. Only material that excess to ecological needs would be removed, if feasible. Economic benefits have been maximized to the extent possible, given LSR status, spotted owl recovery needs, and terrain limitations.

Treatments in Potential Wilderness Area have been modified in response to the Table Mountain Wildfire. Commercial thinning is no longer proposed.

5. Herbicide Use: Proposed use of glyphosate may be harmful to humans, fish, and wildlife.

IDT Response: Glyphosate is authorized for use in the Pacific Northwest Region, under the 2005 Invasives ROD. All required Forest Plan Standards and Guidelines would be implemented, including safety requirements. Effects to humans, wildlife, and fish from herbicide use are addressed in Chapter 3.

6. Procedural Issues:

- Maps and project description in scoping letter were difficult to understand, and had errors.
- Some roads are RS2477, and cannot be closed or decommissioned.
- Scoping opportunity was too short, and occurred in winter when some users (miners) were not present.
- Need to include a timeline and discuss sequencing of project actions.

IDT Response: Project details are now displayed on multiple maps, to reduce confusion. RS2477 status was confirmed on one road, and the proposed action was modified to exclude this particular road. Its status was changed to Non-system.

Scoping notices were mailed to 670 individuals on the Cle Elum Ranger District SOPA mailing list, adjacent landowners, and local miners. A 30-day scoping comment period was provided, and an official 30-day comment period will follow publication of the Draft EA.

Chapter 2 provides additional details regarding changes to the original proposed action, and 9 alternatives considered in response to specific comments, but eliminated from detailed study. In the end, there were no alternatives to the proposed action that also met purpose and need. Therefore, this EA addresses 2 alternatives, Alternative 1 (No Action), and Alternative 2 (Revised Proposed Action). The No Action alternative is provided as a baseline for comparison of effects.

CHAPTER 2 – DESCRIPTION OF THE ALTERNATIVES

Alternatives Considered Then Eliminated from Detailed Study_____

Eight alternatives were considered briefly in response to issues raised during scoping. They were eliminated from detailed study for reasons listed in Table 2.1.

Table 2.1. Alternatives considered then eliminated from detailed study*. Scoping reference no. is from the external comment analysis spreadsheet in Appendix B.

Scoping Ref. No.	Alternative Considered	Rationale for Alternative Elimination
40	Treat only with prescribed fire to eliminate need for temporary roads.	High risk for undesirable fire effects (loss of legacy trees, loss of diversity) in denser stands.
IDT	Treat all burned forest in the PWA and IRA with prescribed fire (a maintenance burn).	Would reduce residual trees, snags, and logs in the post-fire stand, and eliminate new undergrowth, moving some stands away from DFC.
IDT	Salvage burned trees in PWA and IRA, for economic benefits.	Would require temporary road construction in PWA and IRA. Also, DFC for some burned forest is dense old forest structure with abundant snags and logs. Removal would not meet DFC or purpose and need.
45	Retain all existing and capable spotted owl nesting-roosting-foraging (NRF) habitat (“No Take”).	Modeled and dropped because it failed to move (or even nudge) the landscape towards a more resilient condition. Patch and edge densities moved further outside the natural range of variation. Patches of owl habitat remained highly connected and at high risk to fire.
IDT	Treat more marginally suitable spotted owl habitat.	Modeled and dropped. Too similar to the Revised Proposed Action.
1-11, 12, 14	Close open system roads instead of decommissioning.	Risk ratings were reviewed and IDT reconfirmed that target roads were not needed for long-term management. Some would require costly reconstruction to protect streams. They would still incur a cost (monitoring). Reconstruction and monitoring roads that are no longer needed would not meet Purpose and Need.
1	Convert more roads to system jeep trail, instead of closure or decommissioning	Most roads are disconnected from trails and would be costly to maintain as isolated jeep trail segments, and there’s no budget to support expansion of the trail system. Suggestion was considered for a section of FS Rd 9718112 (closed road) that was already being used as part of 4WD 339. It was dropped because of high aquatic risk associated with connecting sections of trail, and need to reroute trail.
45	Helicopter logging to reduce the need for temporary roads.	Prescription is to remove mostly small diameter trees and helicopter logging costs would be too high. The largest available trees must be retained to meet restoration objectives.

*Abbreviations in table: DFC = desired future condition; PWA = potential wilderness area; IRA = Inventoried Roadless Area; IDT = interdisciplinary team

DESCRIPTION OF ALTERNATIVES

I. Alternative 1 - No Action

Under the No Action alternative, there would be no silvicultural treatments (mechanical thinning, treatment of activity fuels, use of prescribed fire or any other non-commercial vegetation treatments). There would be no changes to road and trail locations or status, and no restoration work at problem road/trail stream crossings. Existing illegal hill climbs would not be restored. The Forest Service would continue an ongoing effort to block new hill climbs before they become entrenched, commensurate with funding.

Periodic danger tree management and annual road maintenance would continue along some but not all open system roads, commensurate with an annual road maintenance budget that falls far short of need, and based on road maintenance priorities determined annually by the District Ranger.

There would be no treatment of invasive species beyond those already covered under previous NEPA Decisions². Danger tree management along some open system roads would continue, commensurate with annual road maintenance funding and as prioritized by the District Ranger.

II. Alternative 2 – Revised Proposed Action

Revisions to the Proposed Action after Scoping

The original proposed action (used in scoping) has been revised in response to issues raised during scoping and to changed conditions on the ground. The following changes were made:

- Commercial thinning in the Lion Rock Potential Wilderness Area (PWA) was dropped. Monitoring (2 years after the Table Mountain Wildfire) indicated that the fire had reduced tree densities to a point where open conditions could be maintained using prescribed fire without high risk of undesirable fire effects.
- Plans to decommission certain roads in Williams Creek were dropped, because of RS2477 status. They are now displayed as non-system roads.
- A required mitigation was added to reduce the impact of proposed road decommissioning on 6 miners who have submitted plans of operation that are awaiting approval. These plans entail use of unauthorized roads or trails proposed for decommissioning under this project. No action would be taken on these roads until the mining plans have been approved, and the miners' needs and responsibilities for use of these roads are clear. With an approved mining plan, the roads can be temporarily reclassified as Non-system for the duration of mining, and then decommissioned.

Alternative 2 is the Revised Proposed Action. Planned actions include vegetation treatments (commercial thinning and a variety of non-commercial treatments), aquatic restoration at 59 sites, and changes to the road and trail system.

² Two previous decisions entailed use of herbicides to control invasive species in the current Project Area: 1) *Decision Notice and Finding of No Significant Impact for the Forest-wide Noxious Weed Environmental Assessment, Wenatchee National Forest* (US Forest Service 1999), and 2) *Liberty Hazardous Fuels Reduction Decision Notice* (1996).

Proposed Vegetation Treatments

1. Commercial Thinning and Treatment of Activity Fuels (1327 ac)

Commercial thinning is proposed in dry and mesic stands comprising 21% of the Project Area (Fig. 9). A variable density thinning from below would be implemented, with retention of individual trees, clumps of trees, and openings. The emphasis would be on removal of mostly small diameter trees while retaining all old trees, and appropriate numbers of large trees, snags, and down wood. For additional details, see Silvicultural Objectives and Prescriptions below.

Logging Systems

Both ground-based (feller-buncher, tractor, and winch) and skyline logging systems would be utilized (Fig. 10). Ground-based logging would occur on slopes up to 35% (159 ac). Skyline logging would be utilized on slopes greater than 35% (1168 ac). Small steep inclusions within ground-based units may be left as unthinned pockets to contribute to fine-scale diversity—an objective for all treated stands.

In most skyline areas, cut trees would be yarded uphill with tops attached to landings on roads. A small amount of downhill skyline may be required. In the designated Hill Climb Restoration Area (Fig. 16), however, the tops of trees would be left in the unit to provide coarse wood for blocking and restoring 6 hill-climbs totaling more than 1 mile. Tops would also be used to block a section of 4WD Trail 339 to be rerouted to a more sustainable location. See Site-Specific Restoration Actions later in this chapter.

Skyline corridors and landings would be located after all trees in the unit have been felled, in order to take advantage of natural and created openings for corridors, and to minimize additional removal of trees. Corridors would also be angled so as not to appear as linear strips from nearby roads and trails.

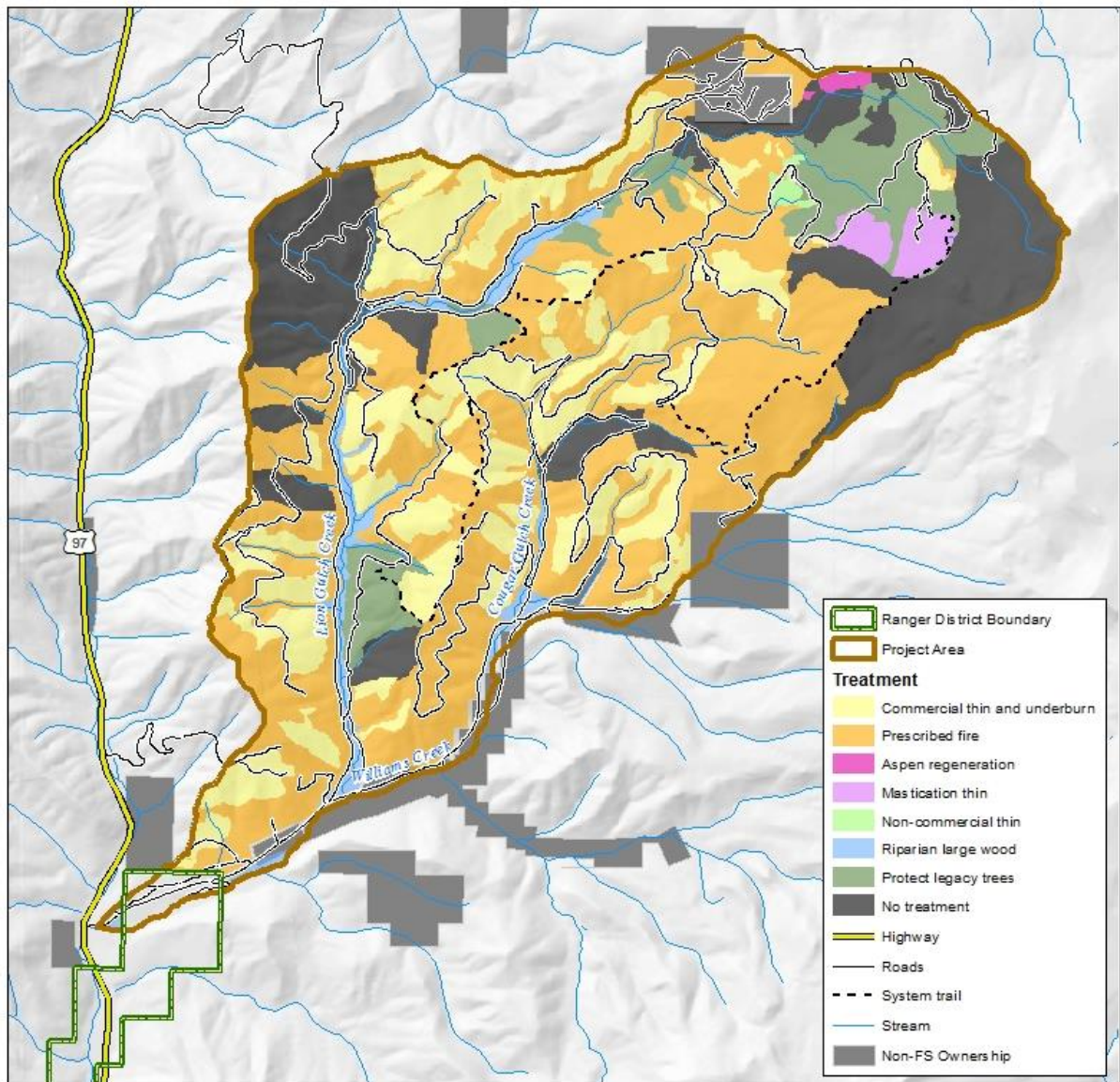
Logging may occur in winter or summer; however, there are required conditions to operate in either season. See Required Mitigations at the end of this Chapter.

Thinning Prescriptions and Design Criteria for Upland Areas

In upland forest, thinning intensity and retention of clumps and complex patches would be based on the desired future condition for each stand (Table 2.2). In addition:

- All old trees and additional large trees would be retained as needed to at least meet and preferably exceed large tree objectives described in the 2012 Forest Restoration Strategy (Table 2.3). Old trees would be identified from form and bark characteristics described by Van Pelt (2008).
- Clumps of large old trees are particularly important. Wherever possible, skyline corridors would be located to avoid the need to remove clumps of old trees.
- Trees with mistletoe, deformed living trees, and pockets of deciduous trees and shrubs contribute to fine-scale (within-in stand) diversity, and provide important habitat structure for wildlife. Wherever practicable, these features would be retained. An example of an action that might be taken to preserve fine scale diversity would be the removal of ladder fuels around low-hanging mistletoe brooms prior to underburning.

Snags and down wood retention would meet or exceed required levels for Late Successional and Riparian Reserves (Table 2.4). These levels are higher than the 1990 Forest Plan standards.



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Source: USFS 2016

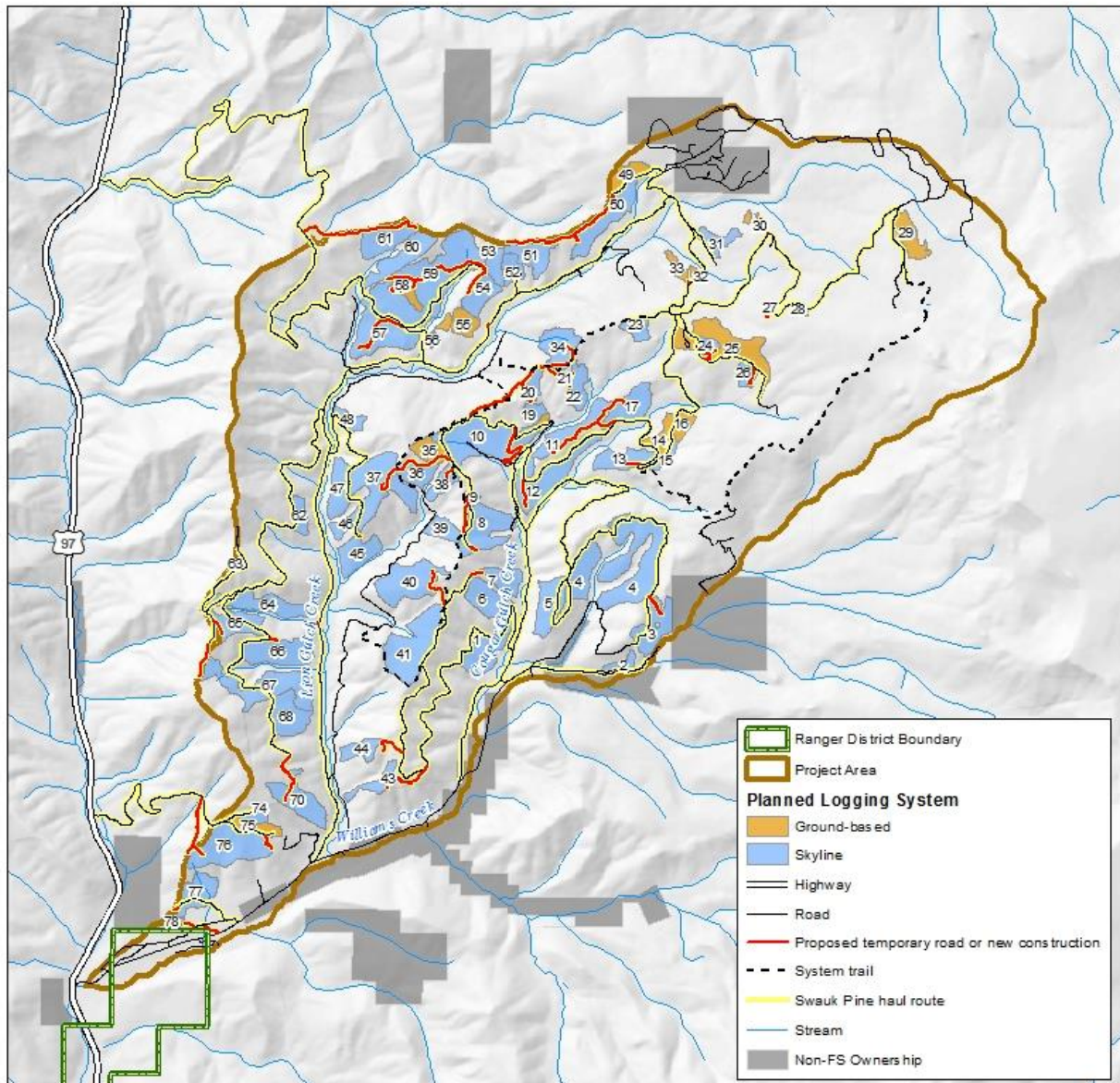


Swauk Pine Restoration Project Figure 9. Proposed Treatments

Okanogan-Wenatchee National Forest
Cle Elum Ranger District
Cle Elum, Washington

0 0.5 1 Miles

1:45,000



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Source: USFS 2016



Swauk Pine Restoration Project Figure 10. Planned Logging Systems and Haul Routes

Okanogan-Wenatchee National Forest
Cle Elum Ranger District
Cle Elum, Washington

0 0.5 1
Miles

1:45,000

Table 2.2. Thinning prescriptions for upland forest. An objective for all thinned stands is to maintain or improve the variability within stands (fine scale diversity) with retention of individual trees, clumps of 2 to 6 trees, and larger unthinned complex clumps (0.3 to 0.5 ac in size). Complex clumps may be designated around protected botanical sites, swales, or areas needed for shade or snowpack retention. To emulate the historic landscape pattern (Plummer 1902), more complex clumps would be retained on lower slopes, leaving upper slopes more open. Openings would be created around clumps.

Desired Future Condition ¹	Thinning Prescription	Post-Treatment % Canopy Closure	Post-Treatment Trees Per Acre	Larger Complex Clumps	Treatment of Activity Fuels	Maintenance Burn	Years to Achieve DFC ³
OFSS	Heavy	30-35	35-45	1 per 10 ac	Underburn ²	YES	40-50
OFSS & OFMS	Moderate	35-45	40-45	1 per 7 ac	Underburn ² or burn pockets	YES	70-80
OFMS	Light	45-55	50-60	1 per 5 ac	Hand-pile and burn	NO	80-120

¹OFSS = Old Forest Single Story, OFMS = Old Forest Multi-Story;

²Pre-treatment may be required (removal as firewood, or hand-pile and burn).

³Estimated time until 1/3 of trees in stand are 20 inches in diameter or greater.

Table 2.3. Desired retention of large, old trees. Source: 2012 Okanogan-Wenatchee National Forest Restoration Strategy (Table 8, page 102). Source for riparian values: Wenatchee Forest-wide Assessment for LSR and MLSAs (Wenatchee National Forest 1997).

Forest Structure Class	Desired Range (no. per acre)	
	Warm / dry Plant Associations	Mesic Plant Associations
Stem Exclusion Open and Closed Canopy	17-34 trees >20" dbh	17-66 trees >20" dbh
Young Forest Multi-story or Understory Reinitiation	11-25 trees > 20" dbh	
Old Forest Single and Multi-Story	18+ trees >25" dbh	
Riparian Dry	17-34 trees >20" dbh	
Riparian Wetter		17-66 trees >25" dbh

Table 2.4. Required levels of snag and down wood retention in LSR. Source: Wenatchee National Forest Late Successional Reserve (LSR) Assessment (1997). The range of values listed is the historic range of variation. They are based on the best available science and exceed levels prescribed in the 1990 Forest Plan. Because of LSR and critical habitat status, the high end of the desired range would apply in mesic, moist, and riparian wetter settings within the Swauk Pine Project Area. Low and mid-range values would apply to drier sites. Values for areas with no green tree recruitment are included here because of proposed natural fuels underburning in areas that burned at high intensity during the Table Mountain Wildfire of 2012.

FOREST VEGETATION GROUP	SNAG DIAMETER CLASS	Areas With Green Tree Recruitment		Areas With No Green Tree Recruitment	
		Snags (no. per acre)	Logs (no. per acre)	Snags (no. per acre)	Logs (no. per acre)
DRY	10"-14"	1.6-3	3-7	1-3	3-10
	15"-19"	1.0-2		4-8	
	20"+	1.1-1.5		6-14	
	All	3.7-6.5		11-25	
MESIC- MIXED	10"-14"	4-10	5-10	3-9	5-10
	15"-19"	2-2		2-4	
	20"+	0.75-2		4-8	
	All	6.75-14		9-21	
MOIST	10"-14"	10-15	25-40	10-15	25-70
	15"-19"	2-6		4-6	
	20"+	2-4		4-8	
	All	14-25		18-29	
RIPARIAN DRY	10"-14"	2-5	7-8	2-5	7-8
	15"-19"	2-5		2-5	
	20"+	6-10		6-10	
	All	12-16		12-16	
RIPARIAN WETTER	10"-14"	12-17	8-40	12-17	8-40
	15"-19"	4-8		4-8	
	20"+	6-10		6-10	
	All	22-35		22-35	

Treatment of Activity Fuels in Upland Areas

Activity fuel refers to the slash generated by logging, which can greatly increase fire risk. To reduce this risk and create a more fire-adapted forest, activity fuels in all commercial thinning areas (except the Hill Climb Restoration Area), would be treated by underburning. Some areas may require pre-treatment to protect residual trees during the underburn. Pretreatments may include removal as firewood, and/or hand-piling and then burning piles.

In the Hill-climb Restoration Area, cut tops not needed for restoration would remain on the ground as woody debris. There is a need here for a higher overall down wood retention to discourage new hill-climbs; therefore the Hill-Climb Restoration Area would not be underburned.

Underburns in thinned stands would be designed to achieve 1-5' flame lengths and incidental tree mortality of no more than 2-3 trees per acre. The desired burn pattern is a mosaic with higher tree retention on lower slopes and less tree retention of upper slopes and ridgelines. Wherever safety permits, snags would be retained before and after underburning.

Burns would be designed to consume 0-3" surface fuels but retain most downed wood over 8" in diameter. Logs in advanced stages of decay (class IV and V) would not be targeted for ignition. Burning is expected to consume some of these and to reduce diameters of residual logs by 0-20%.

Burns may be conducted in spring or fall; depending on stand conditions. Fall burning is the season of choice to protect large old trees, because fine roots no longer extend into dry surface duff. For spring burning, additional measures may be considered for protection of large trees, such as pulling fuels back, pre-treating tree wells surrounded by snow, and adjusting tactics.

Helicopters may be used for ignition of burns. All helicopter and chainsaw use would be subject to seasonal operating restrictions described under Required Mitigations at the end of this chapter.

Approximately 8 to 10 years after the initial underburn, a second maintenance burn would be implemented in all commercially thinned stands with a desired future condition of Old Forest Single Story. See Maintenance Burning later in this section.

Commercial Thinning and Underburning in Riparian Reserves (274 acres)

Most commercial thinning stands encompass some Riparian Reserve. Within Reserves, aquatic objectives such as retention of shade over water and preserving roots that stabilize streambanks would take precedence over other objectives. Thinning in outer reserves is needed to create growing space and increase the recruitment of large trees in and adjacent to floodplains. Edges between upland and riparian commercial thinning areas would be feathered to avoid creating edge.

All perennial streams would have a no harvest/no equipment entry buffer of 110 feet or the height of one site potential tree (whichever is greater), on both sides of the stream. Outside no harvest buffers out to 150 feet from streams, tree removal would be feathered, and designed to retain at least 40% average canopy closure in the outer reserve.

Intermittent streams would be buffered as follows:

- On flatter ground adjacent to channels (<35%), a 50-ft riparian buffer with no harvest and no equipment entry would be observed. Thinning outside of this 50-ft buffer out to 150 feet, would be feathered to provide for higher densities of tree retention in the outer Reserve, and a greater pool for large woody debris recruitment. Average post-treatment canopy closure in the outer reserve would be at or above 40%.
- For intermittent streams with steep, long and continuous side slopes (>35%) a no harvest/no equipment buffer of 75-100 feet would be provided on both sides of the stream. Tree removal would be feathered beyond the buffer out to 150 feet from the stream, to retain at least 40% average canopy closure.

Swales (ephemeral streams) may not have defined scour but often have deep soils and shallow groundwater. They are important areas for snowpack accumulation and snowmelt retention that contributes to summer baseline stream flows. Swales would be identified on sale area maps, and avoided whenever possible. Perpendicular crossing for skidding would be permitted, but swales would not be used for landings or for skidding along their lengths. Wherever possible, swales would be protected by designating them as retention clumps.

In all riparian treatment areas, all trees with diameters at breast height (dbh) of 20" or greater and all deciduous trees and shrubs would be retained. All snags and logs greater than 20" dbh would be protected from disturbance during harvest operations, to the extent practicable. Retention clumps may be designated around these structures to address safety concerns.

Experimental Treatments

A subset of commercial thinning areas have been selected for experimental study of the effects of thinning and various levels of down wood retention on the small mammal prey base for spotted owls (Fig. 11). No treatment control areas, and heavy and light experimental treatment areas have been designated, and two years of pre-treatment baseline data has been collected for both vegetation and small mammal prey populations. This study is a joint effort between the Cle Elum Ranger District and the Pacific Northwest Research Station, Forestry Sciences Laboratory in Wenatchee.

2. Non-Commercial Vegetation Treatments

Seven non-commercial vegetation treatments are proposed, as follows:

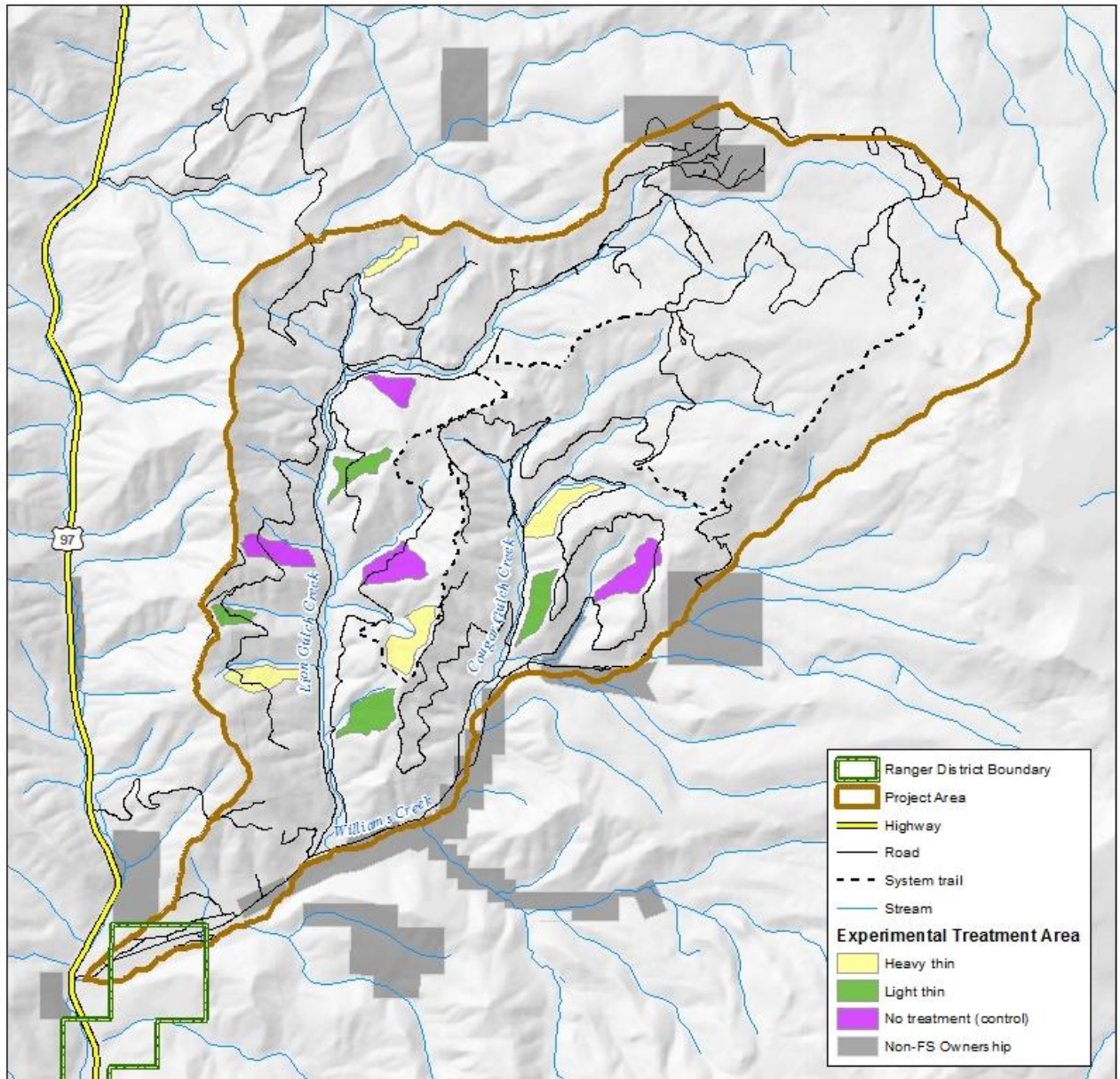
Thinning with Fire: Natural Fuels Underburning (2758 acres)

Thinning will be accomplished with natural fuels underburning in stands that are operationally difficult to reach, and on dry sites dominated by ponderosa pine and bitterbrush (45% of Project Area). Target areas include 436 acres in the Lion Rock Potential Wilderness Area (PWA), and 29 acres in Lion Rock Inventoried Road Area (IRA).

Outside of PWA, areas targeted for natural fuels underburning may be pre-treated by limbing to remove lower branches, thinning out trees < 8", re-arranging fuels around legacy trees, pulling back fuels and/or lopping and scattering fuels. Within PWA and IRA, there would be no cutting of trees of any size except for incidental felling of trees in association with fireline construction. Natural openings and 4WD 334 would be utilized as burn unit boundary to minimize the need for felling trees and new fireline construction in PWA and IRA.

Planned natural fuels underburning in stands outside of PWA may be implemented in conjunction with planned underburning of activity fuels in adjacent stands. Underburning in the Lion Rock PWA would be implemented when fine fuels have recovered enough from the Table Mountain Wildfire of 2012 to once again carry fire. In PWA, the only areas targeted for natural fuels underburning are areas where the desired future condition is Old Forest Single Story (an open forest condition dominated by large old ponderosa pine).

Burns would be designed for mixed severity, with expected mortality of trees at no more than 5 to 10 trees per acre with some group mortality. Mortality in the overstory may result in new openings up to ¼ acre in size. All fire killed trees would be retained as future snags unless they pose a hazard.



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Source: USFS 2016



Swauk Pine Restoration Project Figure 11. Experimental Treatment Areas (Prey Base Study)

Okanogan-Wenatchee National Forest
Cle Elum Ranger District
Cle Elum, Washington

0 0.5 1 Miles

1:45,000

Burns would also be designed to prevent high severity fire in riparian areas. Pre-treatment may be necessary to limit fire intensity, and may include cutting small trees and limbing lower branches. Conditions for ignition and ignition strategy would be the principle means of limiting fire intensity in Riparian Reserves.

On dry bitterbrush sites the intent is to regenerate bitterbrush with a patchy mixed severity fire (low and moderate intensity). At least 30% of the bitterbrush stems would be partially burned or unburned.

Maintenance Burning

Eight to ten years following commercial thinning and underburning or natural fuels underburning, a second maintenance burn would be implemented in those stands with a desired future condition of Old Forest Single Story. No maintenance burning would occur in areas where the desired future condition is dense, multi-layered old forest.

All burning would preferably take place in fall. If risks associated with fall burning are too high, burning may also be implemented in spring, as soon after snow melt as possible and preferably before deer and elk fawning/calving begin (mid-May).

Burns would be ignited using helicopters and/or hand crews. To protect federally listed wildlife and nesting raptors, seasonal operating restrictions may apply to use of helicopters and chainsaws. See required mitigations at the end of this chapter. A wildlife biologist will document the need for any restrictions in burn plans.

Aspen Regeneration (18 acres)

Treatment would entail thinning conifers up to 10" dbh within two tree heights from declining aspen (to create a fuel bed), and/or concentrating slash around declining aspen to ensure a high intensity burn that would stimulate suckering from roots. If after treatment, fire fails to kill enough co-dominant conifers in the stand; residual conifers may be felled or girdled to maintain no more than 20% crown closure around regenerating aspen. All tree felling would be done using chainsaws.

Felled trees may function as natural fencing to protect aspen sprouts. After burning, natural or man-made fences may be erected to exclude elk, deer, and sheep from the regenerating stand (see connected actions, below). Fencing would be maintained for at least 10 years.

Small Diameter Thinning with a Masticator (90 acres)

The desired future condition for these stands is Old Forest Multi-Story. They are harvest areas that were artificially regenerated to ponderosa pine, where a mix of Douglas-fir and true firs would have been more appropriate. The planted pine trees are performing poorly. Trees are too small to be commercial and too large for traditional hand-thinning and piling. They would be thinned with ground-based mastication machinery, to reduce ponderosa pine and release Douglas-fir and western larch.

Machinery used to treat these stands would be low ground pressure with less than 6 psi and capable of reaching out 20' horizontally to masticate trees. The crown closure objective is 30%, with clumps and gaps comprising up to 15% of the treated area. Approximately 45-60 trees per acre and some clumps of 2 to 6 trees would be retained. All existing downed wood, all standing hardwoods, and the largest available Douglas-fir, western larch, and grand fir trees would be retained. Up to 5 trees per acre may be topped to create wildlife snags. After mastication, no other fuel treatment is proposed.

Non-commercial Thin (21 acres)

Small trees would be cut with chainsaws, then hand-piled and burned. The stand would not be underburned. Objectives are to support crown expansion and accelerate growth of residual trees, and shift species composition to Douglas-fir and western larch. Approximately 50-70 trees per acre would be retained, including some clumps of 2-6 trees. Existing logs and snags would be retained wherever possible.

Legacy Tree Protection (509 acres)

Target areas are moist mixed conifer stands where conditions are at or near the desired future condition (dense old forest with multiple layers of trees) (8% of Project Area). These stands are or will soon be habitat for the northern spotted owl. They typically contain legacy trees that are >200 years old. Legacy tree protection may preserve some future seed and shade sources should these stands burn.

Planned treatment is designed to better protect legacy trees from wildfire by re-arranging fuels. No more than two legacy trees per acre would be selected for treatment. All trees <7" dbh within 30ft of the largest legacy trees (and a smaller radius for smaller trees) would be felled and hand-piled or pulled back and lopped and scattered. In addition, downed woody logs within 15' of legacy trees would be bucked and pulled back from legacy trees to reduce fire residence time. Piles and material pulled away from legacy trees would be placed even with or upslope of legacy trees. Larger material would be placed perpendicular to the contour. All piles would be left as prey base habitat. All work would be done by hand. No measureable change in overstory canopy is expected because the only cut trees would be from suppressed tree strata and these trees are generally all overtopped by larger trees.

Large Wood Replenishment (226 acres)

This action would treat approximately 8 miles of stream in the Lion Gulch and Cougar Gulch subdrainages, and affect 226 acres of riparian forest (3% of Project Area). The objective is to reconnect streams with their floodplains and halt downcutting by adding large woody debris (LWD, that is, whole trees, logs, or bundles of logs) to channels and floodplains. Wood placement would not be uniform—the sizes, amounts, orientation, and distances to the stream would vary according to site-specific restoration objectives.

The highest priority area for placement and concentration of LWD structures is the lower 0-1.5 miles of Lion and Cougar Gulches, and also above the 2.0 river mile in Lion Gulch (less frequent placement there). Other unnamed tributaries would also be treated. Additional criteria for selection of treatment areas are found in the Hydrology Specialist Report.

The Washington Department of Fish and Wildlife (WDFW) Stream Habitat Restoration Guide would inform the final design and placement of LWD structures.

To acquire trees and logs for placement in streams, standing trees in the Riparian Reserve would be cut with chainsaws, tipped to retain root wads, or girdled so that they eventually fall over into the target channel or floodplain. Existing down wood may also be relocated. Because of shade requirements in riparian areas and bank stability issues, however, additional trees or logs may be needed from outside of Reserves. Additional trees may be acquired from upland areas that are adjacent to roads and slated for natural fuels underburning. Cut trees would be collected for transport with a self-loader or pulled to the road with cables. The intent is to minimize ground disturbance in the source stand. Singles trees or clumps of trees may be removed, as long as all other objectives (canopy closure, retention of old and large trees, retention of snags, protection of sensitive sites) are met in the source stand. A Forest Service representative would review and approve all tree removal from upland stands for use in Riparian Reserve. Tree removal may occur before and after underburning.

Trees cut within or transported to the Reserve would be maneuvered and placed using a variety of techniques (grip hoist, portable yarder, winches, cable systems, small tractor and/or small tracked excavator). Tractors and excavators would remain on roads and other previously impacted areas unless Forest Service personnel determine that they can travel off-road in a manner that would not impact water quality or affect hydrologic functions. No road construction or removal of riparian vegetation would be allowed, although some damage to understory vegetation is expected. Equipment may be “walked in” on well vegetated routes utilizing existing openings wherever possible. Brush mats (limbs) would be placed where needed to protect soils.

Equipment operation in the Reserve may be suspended for the duration of the fall/winter season on or around October 3, due to increasing soil moisture conditions and streamflows. Conditions would be monitored and assessed seasonally and decisions for shutdown would be at Forest Service discretion.

Equipment tracks and any created openings would be restored through a combination of light surface soil scarification, scattering of coarse woody debris across disturbed ground, and where needed, revegetation with native species prescribed by the District Botanist.

Wood would generally not be anchored as some movement within the channel and floodplain is desirable. Some alteration/excavation of streambanks may be necessary to “embed” a section of a log into the bank. At locations of severe channel incision where both banks are “high”, it may be necessary to excavate into one bank to install a log structure.

3. Actions Connected to Vegetation Treatments

Tree Planting

In 4 ponderosa pine plantation to be jackpot burned (stands 320, 322, 324, and 106), Douglas-fir would be planted (40 to 80 trees per acres) in newly created openings, to restore an appropriate mix of species to these sites.

Haul Routes

Proposed timber harvest would require use of existing open and closed system roads and temporary roads (Table 2.5, Fig. 9 above). Temporary roads would entail either new construction or reconstruction and use of existing unauthorized roads. All temporary roads would be decommissioned as part of the timber sale contract. All temporary roads would remain closed to public use during harvest operations. They may be briefly opened immediately after harvest to allow public firewood removal prior to underburning.

Road decommissioning would conform to standards described in Forest Roads Policy and Forest Service Best Management practices for Water Quality.

Prevention and Control of Invasive Plants

A fully integrated weed control strategy would be implemented to control existing noxious weed populations and prevent weed encroachment into areas that are currently weed-free. This strategy would be multi-phased over time and would utilize one or more of the following treatment methods:

- prevention (seeding or planting with desirable species and mulching heavily disturbed areas, cleaning equipment before arrival at Project Areas; post-project monitoring to determine if noxious weed treatment is necessary).
- manual control (hand-pulling or grubbing with hand tools).
- mechanical control (mowing or clipping).
- cultural control (seeding and/or planting with desirable species).

- chemical control (*spot treatment* of invasive plant species using a truck or ATV-mounted sprayer and hand-held nozzle. Wheeled vehicles would remain at all times on existing roads or skidtrails.
- The herbicides used would be picloram (Tordon 22K®) or glyphosate (e.g. the aquatic formulation of Glypro or Aquamaster), depending on the target invasive plant species and its proximity to water. Where a surfactant is needed to increase the efficiency of the herbicide, the surfactant would be Agri-Dex®).

Table 2.5. Haul routes. Actions associated with column A and B would be implemented as part a commercial thinning contract. Further changes in status indicated in Column C would be accomplished by other means independent of commercial thinning contracts.

Road Actions Needed for Timber Haul (A)	Road Status After Harvest (B)	Road Status After Project (C)	miles
Permanently relocate open system road (FS Rd 9718112), as follows:			
<i>Construct new alignment (use for haul)</i>	open		0.4
<i>Decommission existing route (after haul)</i>	decommissioned		0.24
Construct new system road	closed	4x4 jeep trail	0.2
Construct and use temporary road, as follows:			
<i>New construction</i>	decommissioned		6.8
<i>Use existing unauthorized road as temp</i>	decommissioned		1.4
<i>Use system jeep trail 339 as temp road, then narrow and roughen to restore trail</i>	system jeep trail		0.2
<i>Total Temp Road</i>			(8.4)
Use open system road for haul	open		31.1
	closed		0.9
	closed	decommissioned	0.8
Use closed system road for haul	closed		3.4
	closed	decommissioned	0.2
Use dual use road/trail for haul	dual use		0.8
<i>Total, all haul routes</i>			46.3

Prevention is always the preferred method for dealing with weeds. As prevention and initial control treatments with herbicides are implemented and weed populations decline, herbicide treatment would ultimately be replaced with manual, mechanical and cultural methods described above. Herbicides would be used where other methods have been found to be ineffective or are not feasible.

The area targeted for monitoring and treatment of weeds would include all roadsides in the Project Area (roads open and closed; however, truck- or ATV-mounted sprayers would only be used on open roads. Backpack sprayers would be used on all closed roads). Haul routes, landings, skidtrails, treatment areas (harvest and natural fuels burn areas), obliterated roads, and known weed populations would also be

monitored and treated. We expect to treat between 50 to 300 acres of invasive plant infestations with herbicides, annually for the life of the project (potentially, a 15-20-year span). Herbicide treatments would begin prior to harvest, and end one year after the first follow-up maintenance burn.

Danger Tree Management

Danger tree management would be implemented along all haul routes (approximately 46 miles of road total); Outside of harvest areas, trees within a distance of 1.5 times tree height from roads would be assessed using standard protocols, and if considered dangerous, would be felled and left on site. Approximately 1100 acres of roadside forest outside of harvest units would be subject to danger tree management.

Within harvest areas, danger trees felled by the purchaser may not be removed by the purchaser unless these logs are excess to down wood retention standards (Table 2.4 above). Danger tree felling along temporary roads would occur at the discretion of the purchaser, and felled trees (outside of harvest areas) would be left on site.

Firewood removal in LSR is limited to decks and areas where desired leave trees have been marked for retention by a Silviculturist. In Riparian Reserves, felled danger trees may be signed for retention by the Forest Service, to meet Forest Plan down wood retention standards. In riparian areas, any felled danger trees in excess of standards would be made available for other restoration needs, such as LWD replenishment.

In most places, danger tree management would take place as needed, at any time of year. However, danger tree management within ¼ mi of nesting spotted owls would be restricted to the non-nesting period (before March 1 or after August 31), unless authorization for incidental take is received from the U. S. Fish and Wildlife Service. See Required Mitigations for Wildlife at the end of Chapter 2.

Grazing Restrictions and Exclosures around Burned Aspen Stands

Sheep grazing would be suspended for at least 2 years following first entry underburns and subsequent maintenance burns. The permittee must be notified at least one year in advance of each suspension.

Immediately after burning a woven-wire fence of sufficient height to deter elk would be erected around treated aspen stands, in order to exclude grazing animals (elk, deer, and domestic sheep). Exclosures would encompass 10-20 acres and 1-3 clones. Fencing would be maintained by the Forest Service (or its future partners) until new aspen growth reaches at least sapling size (10-15 years).

Fireline Construction

Proposed burning would require construction of fireline by hand (approximately 1.3 miles total), adjacent to private lands. To the maximum extent possible, natural and man-made openings (such as roads), snow, and rock features would be utilized as burn unit boundaries. Mop-up operations would include rapid closure and restoration of constructed firelines, especially near Forest roads and trails. Fireline restoration would entail installation of drainage features, seeding with native grasses and forbs or non-persistent non-native grasses, and placing logs and other woody material across to roughen the surface, help slow surface runoff, and prevent from being used as motorized trails.

Proposed Aquatic Restoration Actions

1. Aquatic Restoration at Specific Sites

Aquatic restoration actions are proposed at 59 sites (Fig. 12). For additional details, see Appendix C. Actions fall into 4 categories, as follows:

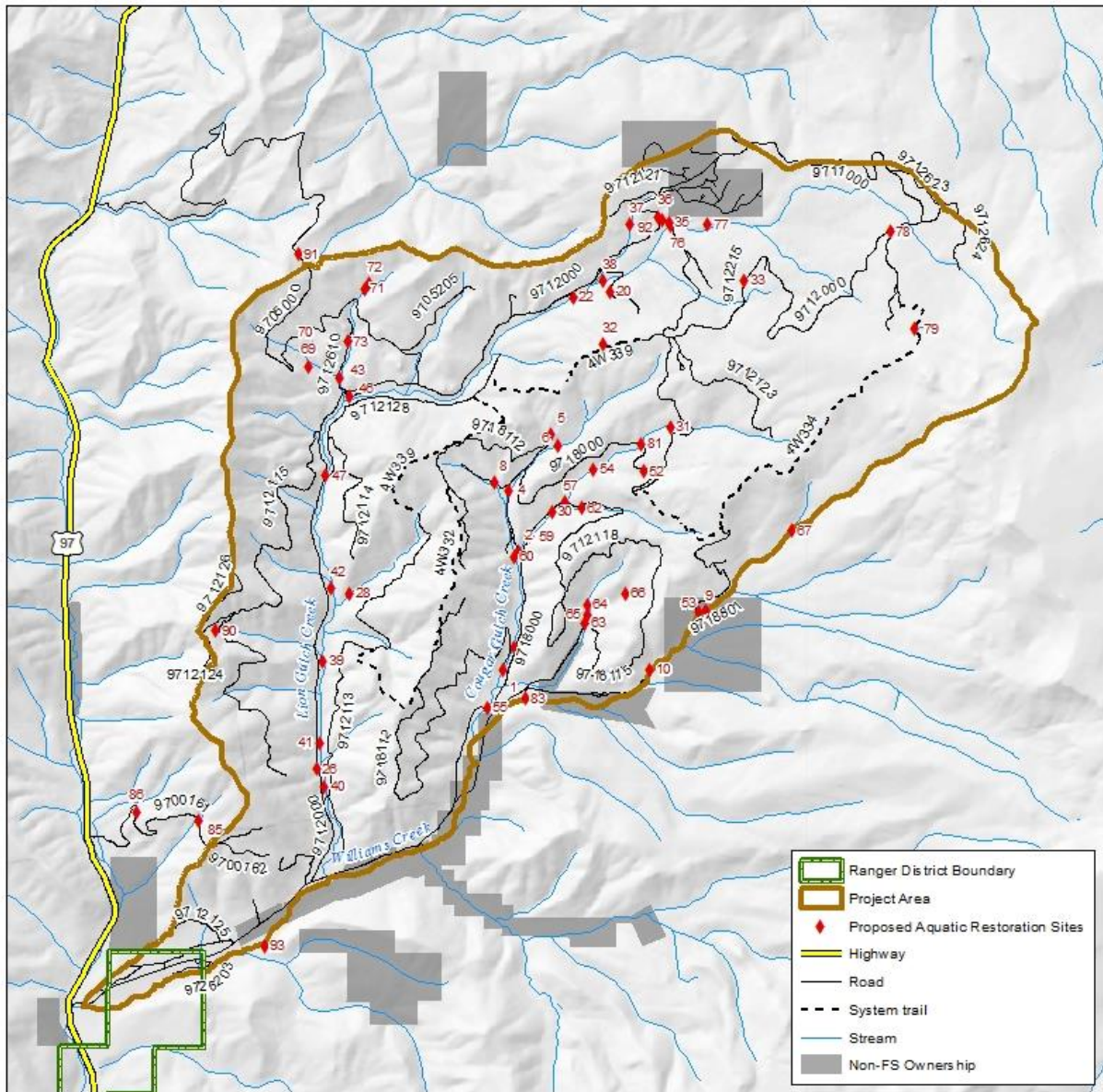
- Actions that would restore degraded riparian soils, vegetation, and wetlands by confining dispersed recreation use and rehabilitating overused areas (4 sites in boxes, Fig. 13). Boulders would be embedded to define acceptable areas of use. Soils would decompacted up to a depth of 18 inches, and barren areas replanted with native species. Large wood would be strategically placed to block user-built trails and support revegetation efforts. Site-specific objectives include:
 - Site 26: Retain parking on shoulder of FS Rd 9712113 and close the unauthorized 100-ft spur to motorized use. Users may walk in to the campsite.
 - Site 46: Reduce campsite footprint by half. Designate an access route and provide/define parking for up to 5 vehicles. Close and restore the unauthorized motorized trail crossing over Lion Gulch Creek.
 - Site 91: Decommission unauthorized road going out the ridgetop, beyond the existing dispersed campsite. Retain existing access between FS Rd 9705000 and campsite.
 - Site 1: Reduce size of dispersed site by one-third due to compaction and damage to vegetation in riparian zone. Designate an access route from FS Rd 9718000.

Proposed road decommissioning would limit motorized access to 5 other dispersed recreation sites (Fig. 14). Users may still walk in to these sites.

- Actions that would restore degraded channel conditions and aquatic habitat, including:
 - Addition of large wood to streams and floodplains (16 specific sites and). For methodology, see previous description of the Large Wood Replenishment Treatment.
 - Removing fill associated with old skidtrails and railroad beds and unauthorized dams and diversions that are barriers to overbank flooding (4 sites in Lion Gulch, and 3 in Cougar Gulch and Bill Goat Gulch).
- Road and trail actions that provide for riparian and aquatic habitat restoration, including
 - installing effective road closures;
 - redesigning road segments adjacent to or crossing streams, wetlands, and groundwater seepage areas to restore natural flowpaths and streambed elevations in wet meadows and flowpaths;
 - decommissioning roads and trails in riparian areas to restore wetland, stream and floodplain functions.
 - reconstructing, relocating, or improving roads and 4X4 trails to eliminate sediment and impacts to hydrology. Improvements would include adding ditch relief and road surface drainage features to disconnect road runoff (from surfaces and ditches) from stream crossing culverts.

Specific road and trail actions are described in the next section.

- Actions that would restore fish passage, by replacing or modifying road culverts (14 sites).



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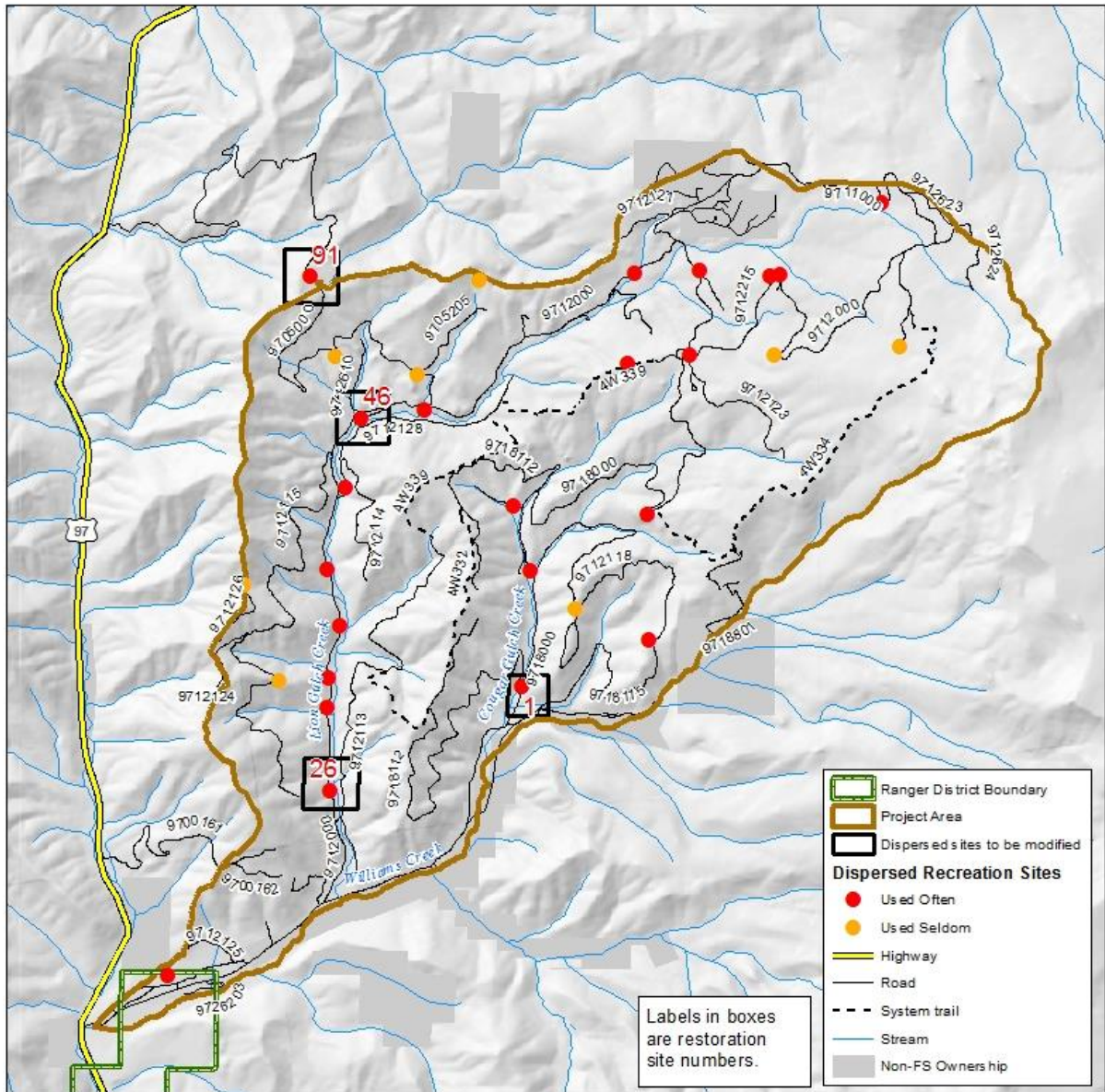
Source: USFS 2016

Swauk Pine Restoration Project Figure 12. Proposed Aquatic Restoration Sites

Okanogan-Wenatchee National Forest
Cle Elum Ranger District
Cle Elum, Washington

0 0.5 1
Miles

1:45,000



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Source: USFS 2016

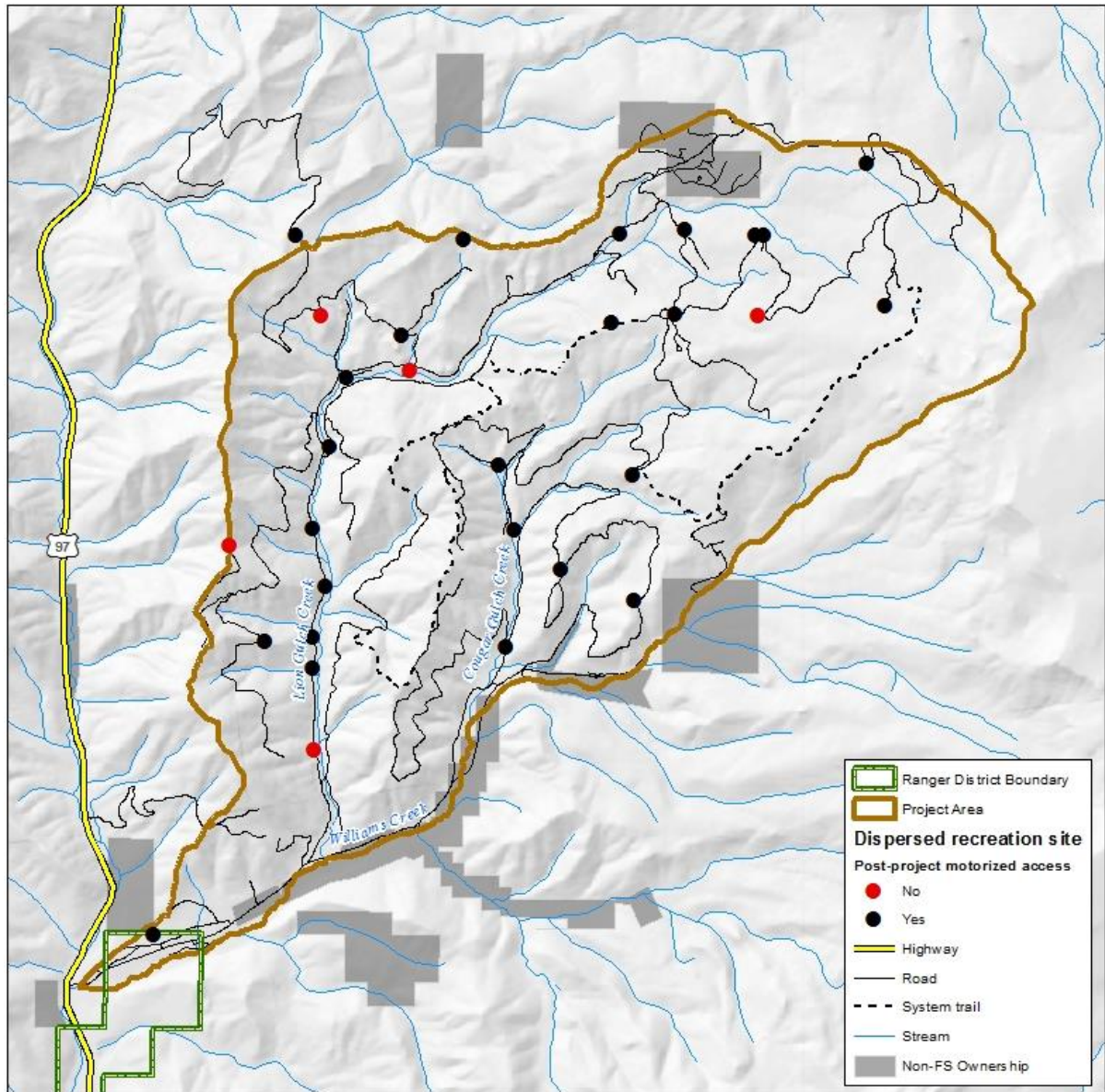


Swauk Pine Restoration Project Figure 13. Dispersed Recreation Sites to be Modified

Okanogan-Wenatchee National Forest
Cle Elum Ranger District
Cle Elum, Washington

0 0.5 1
Miles

1:45,000



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Source: USFS 2016

Swauk Pine Restoration Project Figure 14. Motorized Access to Dispersed Sites

Okanogan-Wenatchee National Forest
Cle Elum Ranger District
Cle Elum, Washington

0 0.5 1
Miles

1:45,000

2. Specific Road and Trail Actions

Relocation of FSR 9718112

In Cougar Gulch, a section of open road would be relocated outside of Riparian Reserve. The new alignment (0.39 miles total) would replace 0.4 miles of existing alignment (including 0.2 miles of severely rutted road in Riparian Reserve and impinging on a wetland).

Two Relocations on 4W 339

Relocation No. 1 and Hill-climb Restoration (Fig. 16)

A section of system trail in the Hill-climb Restoration Area would be relocated to a more sustainable location, and unauthorized hill-climbs totaling more than 1 mile would be blocked and restored. These actions would take place during a required temporary closure of 4WD 339 for public safety during timber haul. The closure may last up to 5 years.

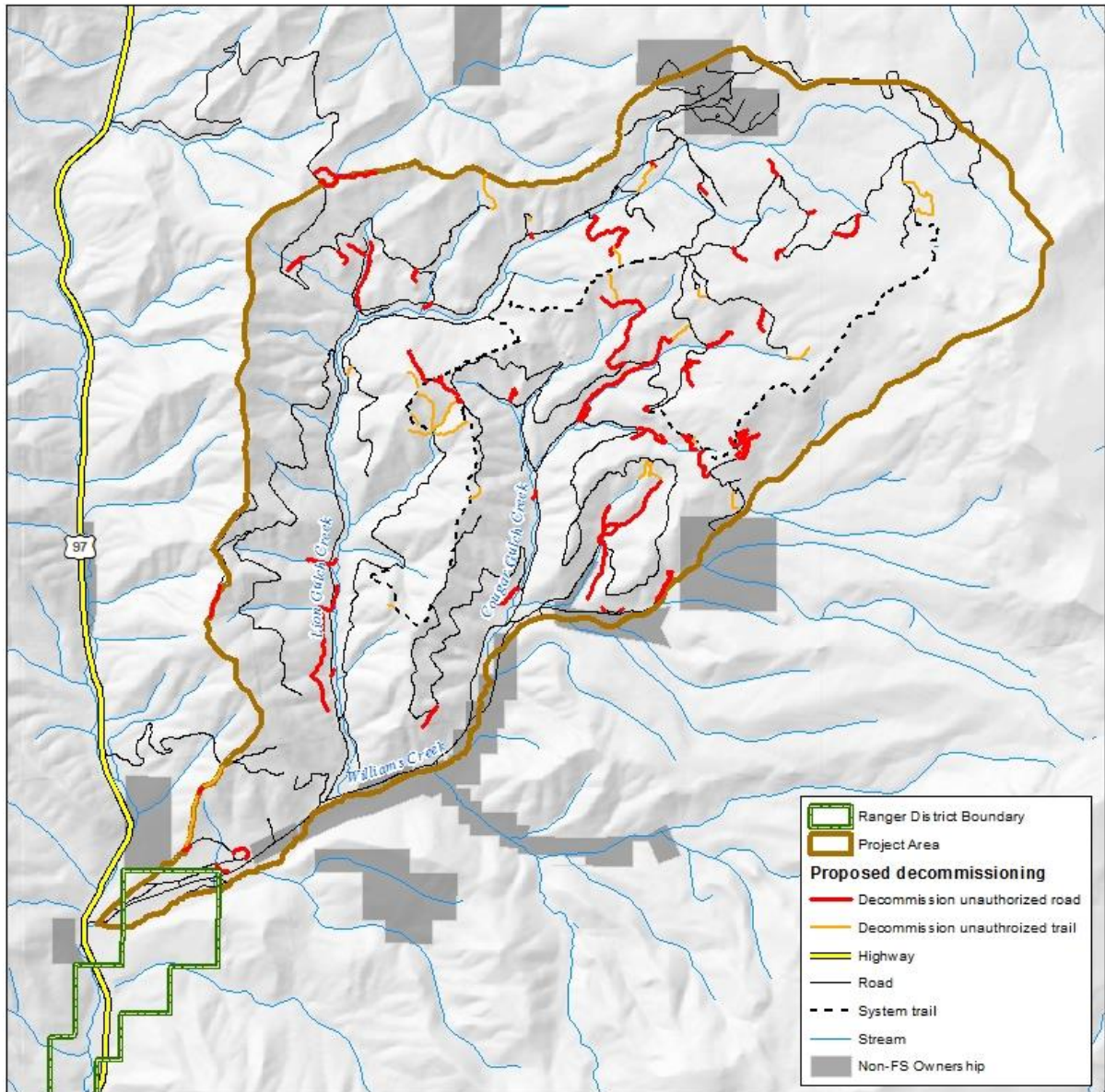
Activities would be sequenced, as follows:

Phase 1 - Restoration of existing system trail and hill climbs, including:

- Soil scarification to restore soil/water infiltration and reduce runoff from trail tread;
- Burying woody debris in the tread to enhance soil productivity for plant growth and moisture retention;
- Recontouring the abandoned tread, where feasible, to match native soil elevations;
- Constructing sediment traps on steeper portions of trail to slow and impound water, and trap sediment;
- Constructing effective barricades at junctions with system trail and roads. These may include rock, wood, and/or snow fencing;
- Installation of signing to inform the public of the nature of this work and to designate open routes.

Phase 2 -Trail relocation:

- Construct the new trail segment, approximately 2700 feet in length, originating at the end of FS Road 9712113, then following the approximate alignment shown in Fig. 16. Required mitigations would include:
 - Final trail relocation to be staked in the field with the involvement of recreation/trails personnel and the district hydrologist. Drainage features (such as rolling grades) would be incorporated into the new trail tread.
 - Beginning of trail will require a new stream crossing approach and a stream crossing structure which meets all appropriate Best Management Practices (BMPs) for flood capacity (100-yr event) and water quality. Beyond the stream crossing, the trail would avoid alignment on an existing abandoned cut skidtrail and instead establish an elevation (following hillslope contours) and grade to provide for positive trail surface drainage.
 - Trail design will avoid concentrating and discharging surface storm runoff back into the stream crossing.
 - Where the new trail transitions from the hillslope contour onto the ridgeline, the trail grade will be flattened to provide for drainage relief. The intent is to avoid trail runoff from being concentrated off of the trail surface and over the hillslope onto highly erodible soils.



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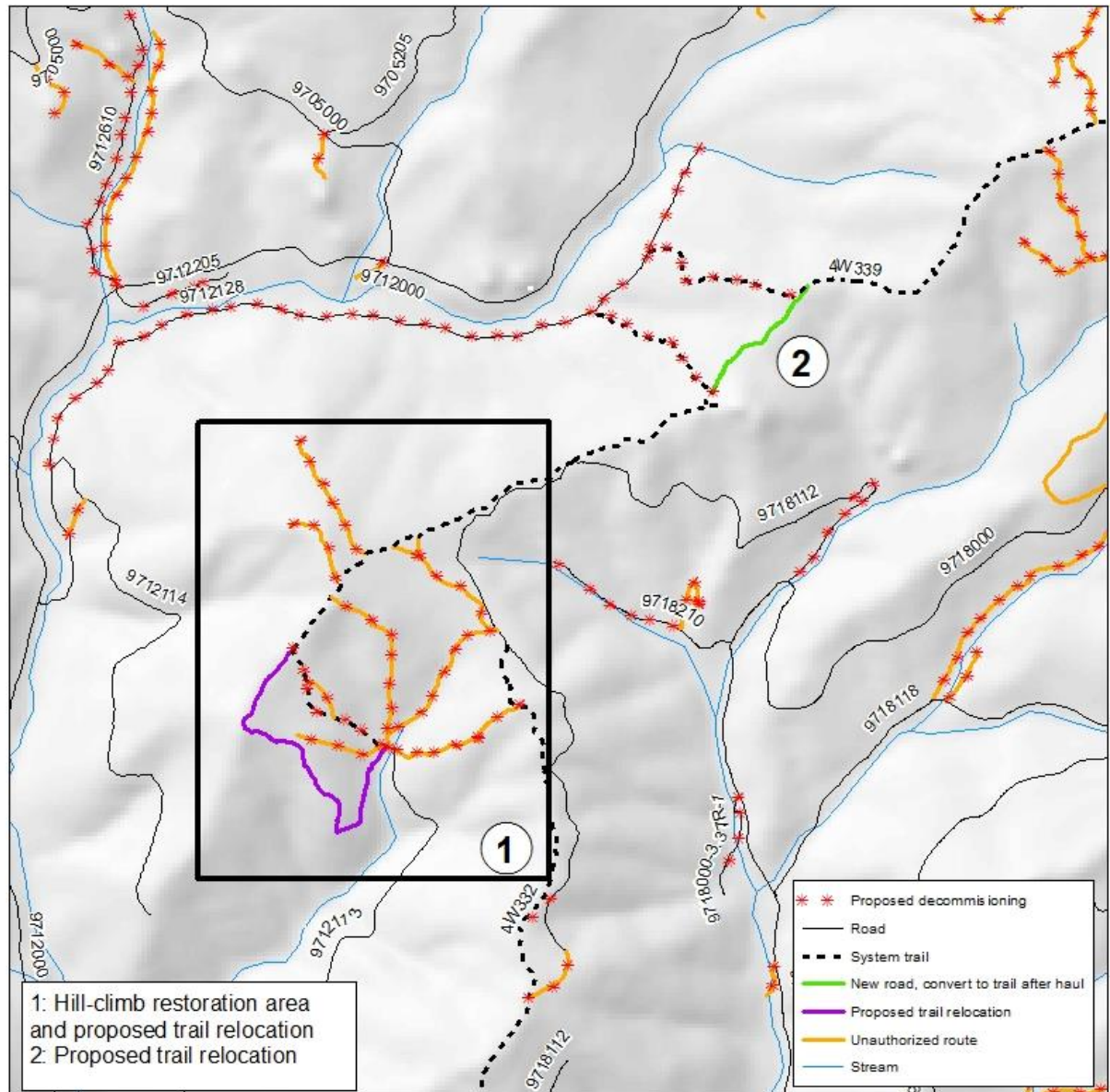
Source: USFS 2016

Swauk Pine Restoration Project Figure 15. Proposed Decommissioning of Unauthorized Routes

Okanogan-Wenatchee National Forest
Cle Elum Ranger District
Cle Elum, Washington

0 0.5 1
Miles

1:45,000



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Source: USFS 2016



Swauk Pine Restoration Project Figure 16. Proposed Hill-climb Restoration and Jeep Trail Relocations

Okanogan-Wenatchee National Forest
Cle Elum Ranger District
Cle Elum, Washington

0 0.225 0.45
Miles
1:12,000

Phase 3 - Monitoring: The Forest Service would enlist the assistance of willing user groups to monitor the effectiveness of restoration efforts in the Hill Climb Area and Lion Gulch. If compliance problems continue to jeopardize restoration efforts, emergency closure may be required in the future.

2. Relocation No. 2 (Lion Gulch, Area 2 in Fig. 16)

Two steep and eroding segments of 4WD 339 between the ridge and Lion Gulch Creek would be decommissioned, and replaced with a new trail segment (0.21 mi total) located on the ridge. The new trail segment would be constructed as a ridgeline haul route to support planned commercial thinning, and left as a closed road at the end of harvest. It would then be roughened and narrowed as part of a permanent road-to-trail conversion.

3. 1.1-mile section of FS Rd 9712113 would also be converted from dual use to system jeep trail, to reduce road maintenance costs while still maintaining a popular 4X4 loop (the 4WD 339 connection to 4WD 332).

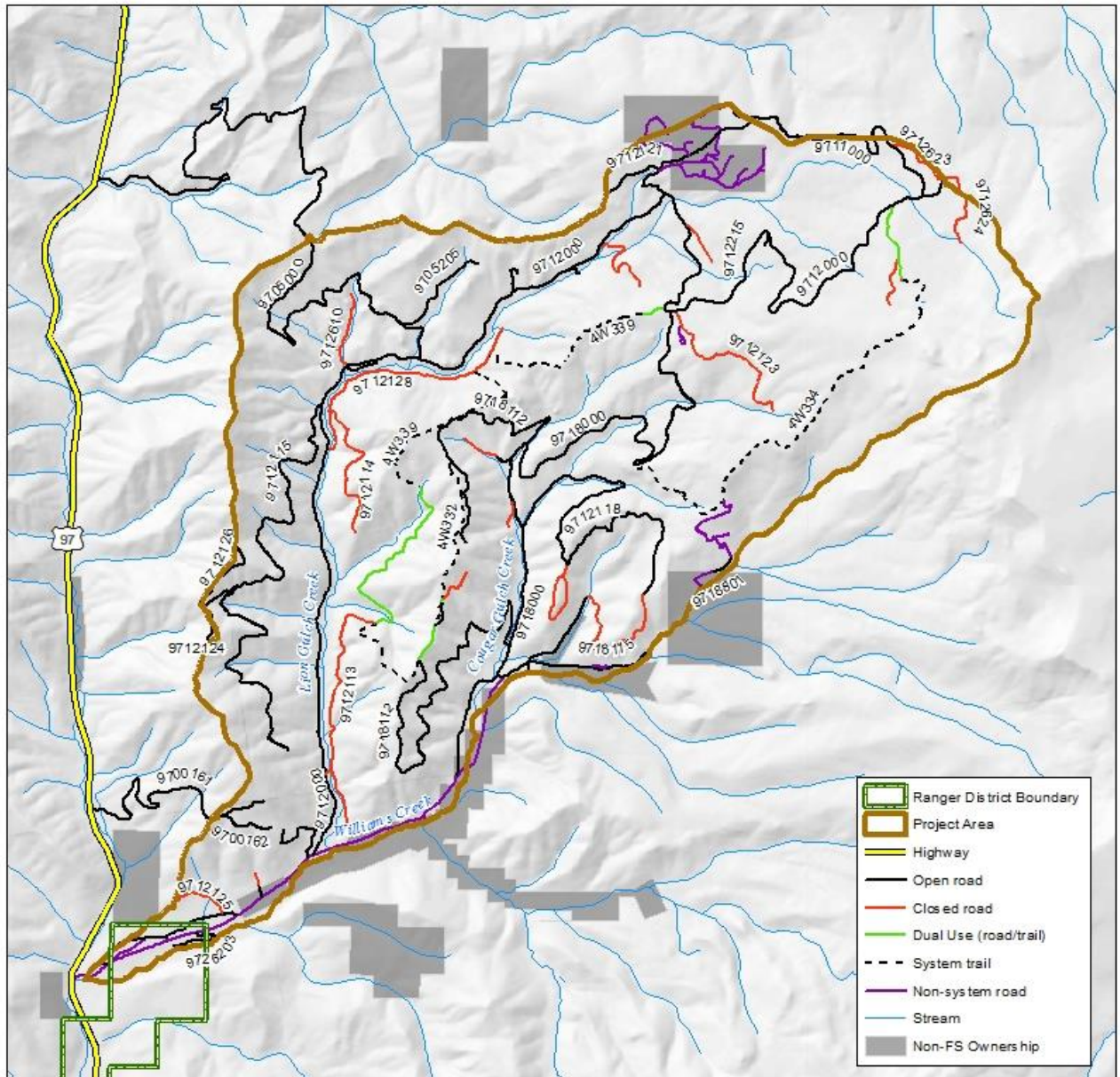
Road Closures and Decommissioning

Proposed road and trail actions would reduce Forest System Roads by 6.3 miles and increase Forest System trails by 1.2 miles (Table 2.6). Figures 17 and 18 compare the current and post-project road and trail systems.

Most of the closed roads to be decommissioned (4.6 out of 5.2 miles) have a high or moderate aquatic risk rating. Most of the open road to be decommissioned (1.4 out of 1.5 miles) also has a high or moderate aquatic risk rating. The two open roads to be closed (FSR 9712124 and 9712126) are ridgetop roads with low aquatic risk ratings. They

Table 2.6. Swauk Pine Project: Changes to Forest System Roads and Trails.

Action	Road or Trail No. / Segment Length (mi)	Change to Road or Trail System (mi)
Decommission a system road (currently open)	9718112 / 0.46 9712207 / 0.17 9705205 / 0.47 9712126 / 0.12 9712205 / 0.14 9712215 / 0.07 9718602 / 0.09	-1.51
Decommission a system road (currently closed)	9712113 / 1.09 9712123 / 0.16 9712128 / 1.19 9712204 / 0.33 9712210 / 0.57 9712214 / 0.26 9712610 / 0.43 9712621 / 0.11 9712622 / 0.02 9712624, / 0.47 9718210 / 0.21 Unnamed / 0.17 Unnamed / 0.16	-5.16
Close a system road (currently open)	9712124 / 0.42 9712126 / 0.48	0
Construct new road alignment (for road relocation)	9718112 / 0.39	0.39
<i>Net change to road system</i>		-6.28
Relocate two sections of 4WD 339, as follows:		
Area 1: <i>New alignment</i> <i>Decommission existing alignment</i>		0.52 -0.21
Area 2: <i>New alignment (built as haul route)</i> <i>Decommission 2 sections of trail that descend from ridge into Riparian Reserve</i>		0.21 -0.46
Convert dual use road/trail to system jeep trail	9712113 / 4WD 332	1.1
<i>Net change to system trails</i>		1.16



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Source: USFS 2016

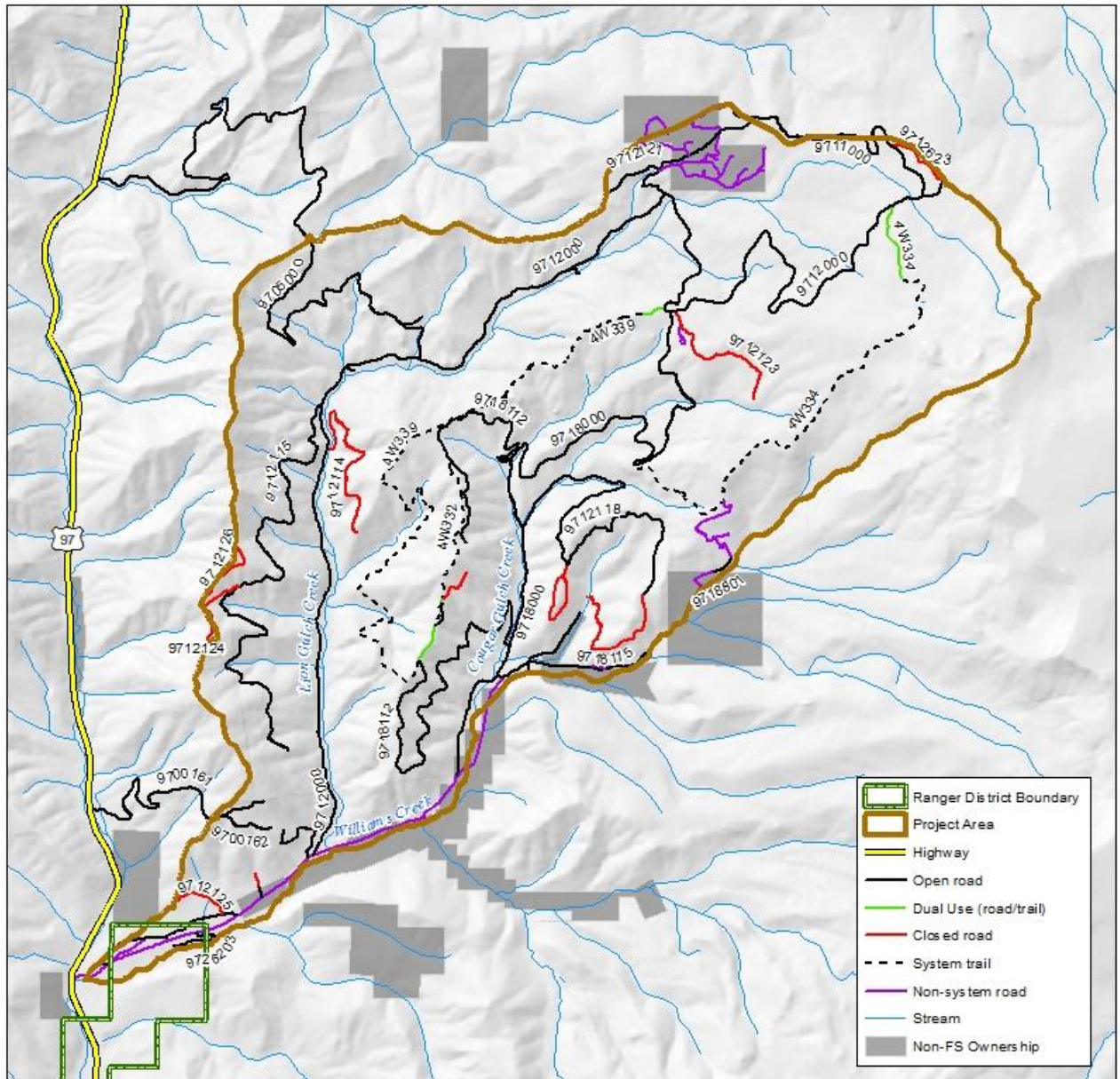


**Swauk Pine Restoration Project
Figure 17. Current National Forest
System Roads and Trails**

Okanogan-Wenatchee National Forest
Cle Elum Ranger District
Cle Elum, Washington

0 0.5 1 Miles

1:45,000



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Source: USFS 2016

Swauk Pine Restoration Project Figure 18. Post Project National Forest System Roads and Trails

Okanogan-Wenatchee National Forest
Cle Elum Ranger District
Cle Elum, Washington



0 0.5 1 Miles

1:45,000

Required Mitigations and Best Management Practices _____

Mitigation is a planning action taken to avoid an impact altogether, minimize the degree or magnitude of the impact, reduce the impact over time, rectify the impact, or compensate for the impact (40 CFR 1508.20). Some mitigations may be required for compliance with laws, regulations, and policies, or Forest Plans. When a commitment is made to implement mitigation measures as part of a decision, those measures must be implemented (40 CFR 1505.3)

Best Management Practices (BMPs) for water quality are methods, measures, or practices selected by an agency to meet its nonpoint source control needs. BMPs include but are not limited to structural and nonstructural controls and operation and maintenance procedures. BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters (36 CFR 219.19).

On the Wenatchee National Forest, use of BMPs is a Forest Plan standard for protection of water quality, as follows: Comply with state requirement for protection of waters through planning, application, and monitoring of BMPs in conformance with the Clean Water Act, regulations, and federal guidance issues thereto (Forest Plan pages IV 94-95).

BMPs are also listed for management of invasive plants, scenery, and mining.

Required Mitigations, by Resource Area

Soils

Many mitigation measures designed to protect the soil resource are covered by Soil and Water Conservation Practices and BMPs incorporated into standard timber sale contracts. The following measures would also apply:

Summer Ground-Based Yarding:

1. Summer ground-based yarding will occur when soils are dry (soil moisture is near or below the permanent wilting point);. Use the soil moisture decision making diagram to make this determination.
2. Historic skidtrails will be used to the extent feasible in ground-based units;
3. Decompact, re-seed, and slash the entrance to skidtrails (first 100 feet), and access to skidtrails from landings, to limit illegal OHV access. Scarification or excavator decompaction will be employed.

Skyline Systems

4. Corridors and landings will have erosion control treatments following logging and site prep activities. Treatments included in the timber sale contract would include construction of water bars and placing of slash on bare soils in the corridors and landings where deemed necessary by the timber sale administrator.
5. Groundcover recovery would be achieved with needle cast and vegetation re-growth.

Temporary Roads

6. Rehabilitation activities on new temporary road construction would include recontouring, slashing, and seeding.
7. Unauthorized roads used for timber haul will be stabilized by removing drainage structures; ripping, seeding, and fertilizing the roadbed; and closing the entrance to these roads.

Hand-piling and Burning (Not Associated with Landings)

8. Pile sizes will average 6-8 feet in diameter so localized areas of soil disturbances will be less than about 50 square feet in size.
9. Pile burning should occur during moist conditions to minimize duff consumption and high severity burn impacts on soils.
10. Where feasible, pile and burn slash where detrimental soil disturbance already exists, such as on old log landings, skidtrails, and roads associated with the past harvest units. By piling and burning thinning slash in areas where soil disturbance currently exists, no new areas of DSD would result from proposed actions.

Prescribed Fire and Maintenance Burning

11. Upon completion of prescribed fire or maintenance burning, at least 70 percent ground cover is necessary to prevent detrimental accelerated erosion and loss of soil productivity. In those cases where ground cover is less than 70 percent prior to burning, consumption and loss of ground cover should not exceed 15 percent. Ground cover includes duff, organic soil horizons, vegetation, fine woody debris, coarse woody material (CWM), and surface coarse fragments. Fire prescriptions will be designed to meet these soil protection requirements.
12. CWM larger than 15 inches in diameter will not be intentionally ignited during hand lighting operations. However, once hand crews light the fire, the fire may burn into large CWM and combust various pieces.
13. Allow time for nutrients to leach from slash prior to burning. The slash will be left through one winter after cutting to allow for initial decomposition and nutrient leaching.

Botanical Resources*Invasive Species*

14. All standard timber sale contract provisions for erosion control and revegetation would apply. timing and inspection would administered by sale administration personnel.
15. Locally adapted native plant material or seeds are the first choice in revegetation or restoration where timely regeneration is not likely to occur. Under no circumstances will non-native invasive plant species be used for revegetation purposes (FSM 2070, 2008, USDA Forest Service 2005, and ROD Standard 13).
16. Certified Weed-free plant materials and mulch would be used for revegetation and site stabilization (USDA Forest Service 2005, ROD Standard 3).
17. Seeding and/or planting would occur at the appropriate times in the spring or fall where needed to reduce erosion, prevent weeds from re-invading, or to hasten recovery of native plant species (USDA Forest Service, 2002, BMP I-4.6, III-10.2).
18. All gravel, fill, sand, quarry and borrow material must be inspected by the county weed board or a district weed specialist before transport or used in the project area. Infested sources are required to be treated before any use of pit material is used (USDA Forest Service 2005, ROD Standard 7).
19. The time between completion of an activity and rehabilitation of a site would be minimized by: (1) open and timely communication between all departments involved in creating and restoring disturbed areas, (2) requiring seeding to be completed within a reasonable amount of time prior to the activity completion and within the correct seeding time frame (3) monitoring disturbed areas for compliance (USDA Forest Service, 2002, BMP I-4.7, III-10.2).

20. Revegetation efforts would be monitored and evaluated (USDA Forest Service, 2002, BMP I-4.9, III-10.2; Standard 12).
21. Road brushing would be avoided on heavily weeded roads once seed has set (USDA Forest Service 2005, ROD Standard 8).
22. Road maintenance activities would be coordinated with invasive plant treatment (hand pulling, mowing, herbicide application, planting) to maximize efficacy (USDA Forest Service, 2002, BMP III-9.1; Standard 8).
23. Application of herbicides to treat invasive plants will be performed or directly supervised by a State or Federally licensed applicator. An herbicide transportation and handling safety plan will be developed prior to application of herbicides (USDA Forest Service 2005, ROD Standard 15).
24. Prior to implementation of herbicide treatment the Forest Service system staff will ensure timely public notification. Signs will be posted in treatment areas to inform the public and forest workers of herbicide application dates and herbicides used. If requested, individuals will be notified in advance of spray dates (USDA Forest Service 2005, ROD Standard 23).
25. Use only adjuvants (e.g. surfactants, dyes) and inert ingredients reviewed in Forest Service hazard and risk assessment documents such as SERA, 1997a, 1997b; Bakke 2002 (USDA Forest Service 2005, ROD, Standard 18).
26. To reduce or eliminate direct or indirect negative effects to non-target plants, terrestrial animals, water quality and aquatic biota (including amphibians) from the application of herbicide, use site-specific soil characteristics, proximity to surface water and local water table depth to determine herbicide formulation, size of buffers needed, if any, and application method and timing. Only consider those herbicides and herbicide mixtures registered for aquatic use when evaluating herbicide use near streams or surface water (USDA Forest Service 2005, ROD Standard 19).
27. Only APHIS and State approved biological agents will be used for biological control. Agents that have a direct negative impact on non-target organisms will not be released (Standard 14).
28. Skidtrails, temp roads and landings will be revegetated with locally adapted native vegetation or covered in weed free woody mulch material if vegetation loss has occurred and bare soil is present (USDA Forest Service 2005, ROD Standard 13 and Standard 3).

Rare Plant Protection

29. A one tree length equipment exclusion buffer will be provided around all know rare plant sites.
30. At least 60% canopy closure will be retained around known *Cypripedium* sites (a species of concern).

Wildlife

31. Operation of tracked machinery, heavy equipment, and chainsaws within ¼ mile of active raptor or spotted owl nests will be seasonally restricted, unless field surveys indicate that birds are not nesting. In the absence of surveys, or if birds are nesting, there will be no operation of equipment between March 1 and August 31.
32. Operation of helicopters within 1km of known raptor or spotted owl nests will be seasonally restricted, unless field surveys indicate that birds are not nesting. In the absence of surveys, or if birds are nesting, there will be no operation of equipment between March 1 and August 31.
33. Spring burning operations within 1 km of *active* spotted owl nests will not result in smoke accumulation in core nesting areas. Burning conditions must be such that smoke trajectories will not fall within 45 degrees of active nests. A test fire will be lit to verify smoke trajectory.

34. No more than 25% of any sixth field watershed will be treated with prescribed fire in a single year.
35. Insert elk calving restriction for selected stands. Operations shall be limited to either Lion Gulch or Cougar Gulch between May 15 and July 15 for the mule deer and elk fawning/calving period.
36. Currently there are no known wolf den or rendezvous sites in the Project Area. If either is located, reinitiate consultation with the U.S. Fish and Wildlife Service to determine appropriate response.

Aquatic Resources (Fish)

Road Construction and Reconstruction

37. Road alignments should be located to minimize disturbance to wetlands, disruption of unconfined streamflow and groundwater emergence and recharge.
38. New or reconstructed road segments originating from existing roads within Riparian Reserves should not exceed a 10% slope gradient within the first 200 ft. of the road segment in order to avoid or minimize the risk of concentrating and channeling runoff and sediment down road surfaces and into streams.
39. Cross-drain road surfaces through a vegetative filter strip prior to road approach reaching stream crossing structure.
40. All temporary roads would be decommissioned under the timber sale contract by the purchaser and/or logger, to a standard which prevents use by all motorized vehicles including OHVs and effectively returns the road to a stable hydrologic state.

Road Management

41. Appropriate erosion control measures such as: seasonal closures, gravelling, maintenance, ditching water routing structures, sediment traps, water bars, and drivable dips would be employed to minimize erosion. Route water off road prisms and fills, and disperse across a vegetated slope.
42. Cross drain and ditch cleanout would be used to remove sediment, debris, and other blockages which impede surface water routing.
43. Road edge berms would not be left after cleanout. Mechanized cross drain and ditch cleanout would not occur within 25 feet of stream channels or crossings.
44. Avoid cutting the toe of cut slopes when grading roads or pulling ditches.
45. Water drafting sites for dust abatement and road compacting would be identified by a fish biologist and/or hydrologist to avoid adverse dewatering effects to fish. Water drafting/pumping would maintain a continuous surface flow of the stream without altering the original wetted width. Any draft suction hose used in fish-bearing waters would be equipped with a screen of 3/32 inch mesh or less and would have an intake flow of less than 1 cubic foot/second to prevent entraining juvenile fish.

Landing construction and Rehabilitation

46. Landing locations on roads within Riparian Reserves would not encroach into the Riparian Reserve and would be constructed into the treatment unit. A native vegetation filter strip or concentrations of logging slash would surround the perimeter of all landings located within Riparian Reserves to serve as a sediment trap. Objectives for landing construction include maintaining the existing mature conifer and hardwood overstory to maintain riparian shade within the reserve (also consider location of slash piles for retention of overstory canopy).
47. Landings would be located in upland portions of the reserves, on flat terrain, and disconnected from surface or groundwater flow paths. Landing construction locations would avoid seeps, springs and wetlands, as well as draws and ephemeral channels.

48. The size of new landings in the riparian zone would be what is minimal to log while best protecting riparian soils and tree retention.
49. Post-logging soil scarification and reseeded would be done on landings to restore infiltration and ground cover on all compacted soils.

Felling and Yarding

50. Avoid downhill yarding and skidtrail layout converging into Riparian Reserves, particularly where skidtrails converge onto a road surface within the reserve. This action increases the risk of capturing and concentrating overland flow and storm runoff and delivering it to streams, which affect peak flows downstream.
51. Designate skidtrails at a minimum of 100 foot spacing to minimize risk of overland flow.
52. Directional felling and designated skidtrails and skyline yarding corridors would be established within the treatment portions of Riparian Reserves.
53. Skidding and yarding would not occur across the no treatment areas of Riparian Reserves.
54. Avoid downhill yarding onto roads located in Riparian Reserves using either ground or skyline yarding systems in order to prevent soil movement into Riparian Reserves.
55. Install waterbars on all skidding corridors upon completion of yarding operations.

Fuels Management/Slash Disposal

56. Test fire will be conducted in the treatment portion of Riparian Reserves to confirm appropriate low intensity burning conditions prior to stand ignition.
57. Burning of landing slash piles located in Riparian Reserves would not occur until the soil decompaction work is completed at the landing and temporary roads to protect the intended function of the piles as sediment traps for runoff from landings.
58. Slash would not be piled, concentrated, or burned? within the no treatment portions of the Riparian Reserves.
59. Firelines would have waterbars (ditches or dips built into the fireline, not berms) constructed to divert surface water off of the line and onto vegetative surfaces. Waterbars would be constructed at the time of fireline construction.
60. Hand firelines may need to be constructed within 100 feet or one site potential tree length from streams to tie in suppression needs with anchor points; wherever possible fireline within 100 feet or one site potential tree from streams will be avoided. No handline would be constructed within inner gorges of stream channels.
61. Fireline would be rehabilitated using methods that prevent public use as hiking trails, bike routes, motorcycle routes, etc.
62. Design fire prescriptions to not exceed a severity rating of low for 90% of the no treatment area of Riparian Reserves, with no more than 10% of the no treatment area in a moderate severity rating. Fire severity ratings are as follows:
 - a. Low Fire Severity: Low soil heating, or light ground char, occurs where litter is scorched, charred, or consumed, but the duff is left largely intact, although it can be charred on the surface. Woody debris accumulation is partially consumed or charred. Mineral soil is not changed. Fire severity in forest ecosystems is low if the litter and duff layers are scorched but not altered over the entire depth.
 - b. Moderate Fire Severity: Moderate soil heating, or moderate ground char, occurs where the litter on forest sites is consumed and the duff is deeply charred or consumed, but the

underlying mineral soil surface is not visibly altered. Light colored ash is present. Woody debris is mostly consumed, except for logs, which are deeply charred.

- c. High Fire Severity: High soil heating, or deep ground char, occurs where the duff is completely consumed and the top of the mineral soil is visibly reddish or orange on severely burned sites. Color of soil below one cm is darker or charred from organic material. The char layer can extend to a depth of 10cm or more. Logs can be consumed or deeply charred, and deep ground char can occur under slash concentrations or burned-out logs. Soil textures in the surface layers is changed and fusion evidenced by clinkers can be observed locally.
63. Locate re-fueling and fuel storage areas outside of Riparian Reserves or on a road, away from water and drainage areas, in locations where the largest possible spill can be contained before entering water. In the event of a fuel spill during a burn project the Forest Hazardous Materials Coordinator would be contacted to coordinate clean up.
 64. The use of pumps would not involve any streambed alteration, and pump chances would not pose any barrier to fish movement. Intake screens would be used on all pumps. Fuel would be located in containment basins and hazard materials spill kits would be available for spill containment.
 65. No surfactants or foams would be used within 100 feet of the edge of wetted channels or wetlands. Engines which have had surfactant would not draft from fish-bearing waters. The deployment of hose will not require any ground disturbance, and in many cases the use of hose for wetline could reduce the need for hand fireline construction.
 66. Pump locations would be identified by a fish biologist and/or hydrologist to avoid adverse dewatering effects to fish. Coordination of pump locations will occur with resource specialists. Water drafting/pumping would maintain a continuous surface flow of the stream without altering the original wetted width. Any draft suction hose used in fish-bearing waters would be equipped with a screen of 3/32 inch mesh or less and would have an intake flow of less than 1 cubic foot/second to prevent entraining juvenile fish.

Aquatic Restoration Projects

67. Project design criteria for road decommissioning, culvert removal/replacements, in-stream channel work, large wood placement, and dispersed campsite modifications are from the *Programmatic Biological Assessment for Fish Habitat Restoration Activities Affecting ESA-Listed Animal and Plant Species and their designated or proposed Critical Habitat and Designated Essential Fish Habitat under MSA found in Oregon, Washington and portions of California, Idaho and Nevada* (USFS/USDI/BIA 2013).
68. All provisions and standards in the Memorandum of Understanding between Washington State Dept. of Fish and Wildlife and USDA Forest Service, Pacific Northwest Region (USFS and WDFW 2012) will be followed.
69. All conditions and requirements within the U.S. Forest Service Aquatic Restoration Program regional general permit (RGP-8) (USACE 2011) will be met.
70. All design criteria and conservation measures in the 2013-2017 Programmatic Biological and Conference Opinions (BiOps) for Aquatic Restoration Activities in Oregon, Washington and portions of California, Idaho and Nevada will be met (NMFS 2013 and USFWS 2013).

LWD Placement

71. All work that would be conducted within the wetted channel would occur during established in-water work windows. Flood plain work or work outside of the channel may occur at any time of the

- year; however, seasonal operating restrictions would apply to operation of chainsaws and heavy equipment. See required mitigations at the end of this chapter.
72. Tree removal within the Reserve would be done in a manner which protects existing shade over water and prevents any increase in maximum water temperatures due to canopy removal. Additionally, no tree removal would be done in a manner which would reduce stream bank stability.
 73. For tree removal in upland areas: retain all standing trees and snags exhibiting cavities, hollow structure or dwarf mistletoe brooms. Retain all hardwood trees. Retain the largest available trees for large tree retention, and do not remove trees >25" dbh, unless they are surplus to the large tree retention need. Remove trees 20" dbh to 24" dbh only if they are not needed to meet large tree retention objectives (Table 2.4 above).
 74. Do not remove trees or operate equipment within falling radius of standing snags;
 75. No trees would be removed from areas designated as "No Treatment" or "Commercial Thinning (Fig. 9 above). For protection of wildlife, only light removal may occur in certain dense stands in middle Lion Gulch. A wildlife biologist will provide a map of restricted cutting areas for use during implementation.

Herbicide use

76. To avoid adverse effects to MCR steelhead, application of herbicides would not occur within 50 feet of Williams Creek between late June and early August when there is a high probability of juveniles occupying stream margin habitat where potential drift from herbicide application would not dissipate from the low flow and low stream mixing stream margin habitat.

Range

77. Annual operating and implementation plans for range use, invasive plant management, non-commercial thinning, prescribed burning, and riparian treatments would be coordinated annually, to reduce or avoid potential conflicts.
78. Range permittees would be notified prior to herbicide application and applicable management practices would be followed.
79. Ensure adequate access to grazing areas (using roads) in order to utilize as much of the allotment as possible and to minimize impacts to major road corridors.
 - When a road is closed or decommissioned, either maintain 300 feet of space at the road beginning or provide alternative parking area for the permittee.
 - When restoration work is performed (and avoidance is requested) in close proximity to authorized Key Route, an alternative route, and/or bed grounds, adequate access must be identified and provided in order to honor the ten (10) year Term grazing permit.
80. Deferment of grazing for up to two seasons would be implemented prior to and following prescribed fire and thinning treatments to encourage vigorous seedling establishment.
81. Coordination with the botanical resources regarding the protection of rare plants would occur annually.

Recreation

82. Winter logging may require plowing of roads used as groomed snowmobile routes. If that occurs, these roads would be closed to public use from Monday through Friday, due to safety concerns. The contractor would retain at least 4 inches of snow on plowed routes. Plowed roads would be open to public use (snowmobiling) on Saturday and Sundays.

Cultural Resources

83. All sites found (through consultation with the State Historic Preservation Office) to be eligible for protection under the National Historic Protection Act will be protected through avoidance.

Scenic Resources Design Criteria/BMP's

The following mitigation measures are developed to meet the intent of a Moderate to High Scenic Integrity level for the Liberty Road Viewshed and Community of Liberty, Lion Gulch FR 9712 loop to Cougar Gulch FR 9718 & Durst Creek FR 9705, and backdrop setting along private lands from Williams Gulch to Price Ranch. Liberty viewshed is rated as a level 1 sensitivity with Retention VQO and the Lion Gulch and Cougar Gulch Forest road travel routes rated as a level 2 sensitivity with a Partial Retention VQO.

84. Landscape Architect and Recreation Technician/Planner will review marking of units prior to logging in the high scenic concern areas of Liberty Road Viewshed and Community of Liberty, Lion Gulch FR 9712 loop to Cougar Gulch FR 9718 & Durst Creek FR 9705, and backdrop setting along private lands from Williams Gulch to Price Ranch.
85. Changes in form, line, color and texture resulting from management activity should not be evident for more than one season in ST-1 areas and two seasons in ST-2 prescriptions areas (WNFP, page IV 205-215). Rehabilitate area to be natural appearing by earth re-contouring, removal of woody materials from site, area smoothed out and grass seeded with appropriate grass mix.
86. Mechanical evidence created along the immediate roadside of Liberty, other private property located in the rural interface and along the Lion Gulch FR 9712 loop to Cougar Gulch FR 9718 & Durst Creek FR 9705 will be rehabilitated.
87. Complete removal of ribbons, tags, stakes where visible from main roads. Paint of backside of leave trees/snags or paint take trees/snags along immediate foreground of Liberty, other private property in the rural interface, and along the Lion Gulch FR 9712 loop to Cougar Gulch FR 9718 & Durst Creek FR 9705.
88. Enhancement of large tree viewing opportunities from travel routes, Liberty and rural interface homes, by thinning and removing smaller trees around large trees.
89. Blend earth mounds and large boulders adjacent to the existing landscape for road closures, rehabilitate landings along all main roadsides.
90. Locate skyline corridors at angles to avoid linear effect as viewed from community of Liberty, other private property in the rural interface, and along the Cougar Gulch Forest road 9718 and Lion Gulch Forest road 9712. Where possible, maintain skyline ridge of trees with varied clumping and spacing of leave trees where possible.
91. Locate landings outside of seen areas or leave vegetation screening where possible. When landings are located on Forest Roads, keep them within the existing road prism and do complete cleanup of roadside when done.
92. Thinning along visually sensitive roadsides, the community of Liberty and other private property located in the rural interface be designed with special markings with variable spacing of leave trees, clumping of a variety and diversity of tree species for textures to mosaic underburning to emulate a natural appearing forest environment. Stumps and woody debris left would be subordinate to the landscape.
93. Low stumps (8" or less) and woody debris cleanup in the immediate foreground area (100' from main roads).

REQUIRED BEST MANAGEMENT PRACTICES for HYDROLOGY WATER QUALITY*Commercial thinning in Riparian Reserves*

1. Sale Area Maps will depict the intermittent/ephemeral streams as “protected stream courses” to minimize potential impacts.
2. Landing locations will avoid using Riparian Reserves, non-forested swales, and moist to wet meadows, to prevent detrimental soil compaction and accelerated runoff. Where they cannot be avoided a technique referred to as “hot loading” of logs on trucks will be considered to minimize the size of landings in sensitive areas.
3. Stream channel locations have not been field mapped across the planning area. In cases where there is a discrepancy between stream locations on the ground and those displayed in our GIS database, the individuals with knowledge of this circumstance will work with hydrology to correct the error to accurately reflect streams on the Sale Area Map.
4. Skyline corridors would be located to avoid Reserves where possible, and if they cannot be avoided, then logs would be fully suspended to “fly” over the Reserves.
5. As fine-scale diversity, retain more trees on productive sites identified by the district hydrologist. See the Hydrology Specialist Report for specific prescriptions.
6. Mitigation is required for haul and closure of FSR 9705205. See the Hydrology Specialist Report.

Temporary Road Construction

7. Temporary roads will be constructed no sooner than required by purchaser, with logging scheduled for completion in a single season of operation.
8. Roads locations will be located in a way that attempt to flatten grades going into and coming out of swales and stream crossings, to minimize conveyance of water over steep grades into crossings.
9. Roads will generally be outsloped to avoid constructing ditchlines.
10. Temporary roads located in areas with unauthorized 4WD risks will install temporary gates to maintain a closure to public use and resource damage for the period the road is on the landscape.

Natural Fuels Underburning

11. Direct ignition of fuels for purposes of underburning of stands located within and adjacent to Riparian Reserves will be limited. Where necessary, it may be conducted only in applied where there is high likelihood of achieving both the fuel reduction objectives and the protection of mature overstory canopies.

BEST MANAGEMENT PRACTICES for MINING

12. Where feasible when a road is decommissioned a pull out and/or foot path will be left for walking to a known mine site.
13. Vehicle access will be eliminated for one dispersed campsite but access by foot and dispersed camping will be maintained by the creating pullout parking and designated paths.
14. Operators will be notified of the schedule for decommissioning and the timeframes for submitting a proposed Plan of Operation for review as soon as they are available.
15. Fire crews will work to keep fire from directly impacting mine features such as claim markers, equipment, supplies and structures.
16. Mine sites would be buffered from Commercial Harvest, Underburn, and Prescribed Burning treatments.
17. Hand crews will be required to avoid materially interfering with the mining operations.

CHAPTER 3 - ENVIRONMENTAL CONSEQUENCES

This chapter describes current conditions in the Project Area and effects that would result from implementation of Alternative 2, the Revised Proposed Action, or Project. Alternative 1, No Action, provides a baseline for comparison of effects.

The information presented in this chapter summarizes and cites detailed specialist reports that are found in the project analysis file. The effects described in each report assume that all design criteria, required mitigation, and site-specific BMPs are implemented as described in Chapter 2.

Actions Considered for Potential Cumulative Effects

Each specialist report describes the direct, indirect and cumulative effects of the project. Cumulative effects are those that result from the incremental impacts of the action when added to other past, present, and reasonably foreseeable actions. For a cumulative effect to result, effects of other actions must overlap effects from this project in space (the analysis area) and time (the duration of effects). Some past actions may still be having effects on one resource, but not another.

As determined by the Council on Environmental Quality (CEQ) the analyses for Swauk Pine rely on current environmental conditions as a proxy for the impacts of all past actions.

Interdisciplinary Team (IDT) members considered the following actions for their potential contributions to cumulative effects:

Past and Present Actions

- Past and ongoing timber harvest (project area, Upper Swauk sixth field watershed, and for some resources, district-wide).
- Road construction associated with previous and ongoing timber sales.
- Mining activity
- Lion Gulch Creek Riparian Restoration Project
- Ongoing invasive plant treatments under previous Forest Service decisions
- Sheep-grazing under the Swauk Allotment Management Plan
- Historic sheep-grazing
- Mushroom collection following the Table Mountain Wildfire of 2012
- Fire Suppression and BAER activities associated with the Table Mountain Wildfire
- Routine road and trail maintenance
- Groomed winter trail program
- Experimental barred owl removal

Reasonably Foreseeable Actions

- Implementation of the Okanogan-Wenatchee National Forest Access and Travel Management Plan (decision expected in late 2016).
- Expanded tools for treating invasive plants, under the pending Forest-wide Invasives Environmental Impact Statement (EIS). A decision is expected in summer 2016.

Effects by Resource Area

Soils

Introduction

The long-term sustainability of forest ecosystems depends on soil productivity and proper soil hydrologic function. Ground-disturbing management activities that result from timber harvest and fuel treatments can directly affect soil properties and change their capacity to perform key soil functions. The inherent potential of soils and their likely responses to disturbance are the focus of this analysis.

Regulatory Framework

- Forest Plan Soil Standard: Management activities shall not result in more than 20% Detrimental Soil Disturbance (DSD) in a treatment unit (pp. IV-97).
- Wenatchee National Forest Ground-based Timber Harvest Policy: No ground-based yarding on slopes >35%.

Methods and Scale of Analysis

The analysis area for soils encompasses all land within individual treatment units (activity areas). In general, soils outside of unit boundaries are not expected to be directly, indirectly, or cumulative affected by proposed actions.

A professional journey level soil scientist conducted field surveys in proposed treatment units. Areas of past treatment similar to the proposed treatments were also monitored. Soils within the analysis area have been mapped and are described in the Okanogan-Wenatchee National Forest Land System Inventory (National Resources Conservation Service (NRCS) Soil Survey). Effects are considered over short (0-5 year) and long (5-20 year)-terms.

Existing Conditions

The principle landforms in the Planning Area are high ridges and mountain tops, surrounded by upper rocky hillslopes in the northeast and western portions of the planning area. Mid-slope ridges occur on area of less relief below these slopes and between drainages. Mid-slope and shallow valley drainages occupy the lower parts of Lion Gulch and Cougar Gulch. These drain into a wide plain at the bottom of the planning area where unique habitats, wetlands, and areas that attenuate flooding are expected.

Water storing soils occur in a variety of landscape positions, principally in areas where geologic mass wasting was a factor in development of the landform (northeast part of the planning area and an area of hummocky terrain in Upper Lion Gulch, circled area in Fig. 19).

Wetlands and soils that have seasonal water tables are also important for water storage (Fig. 20).



Fig. 19. Major geomorphic processes (brown = glacial, blue = mass wasting) in the Swauk Pine planning area. Blue areas encompass dominant water storing soils.

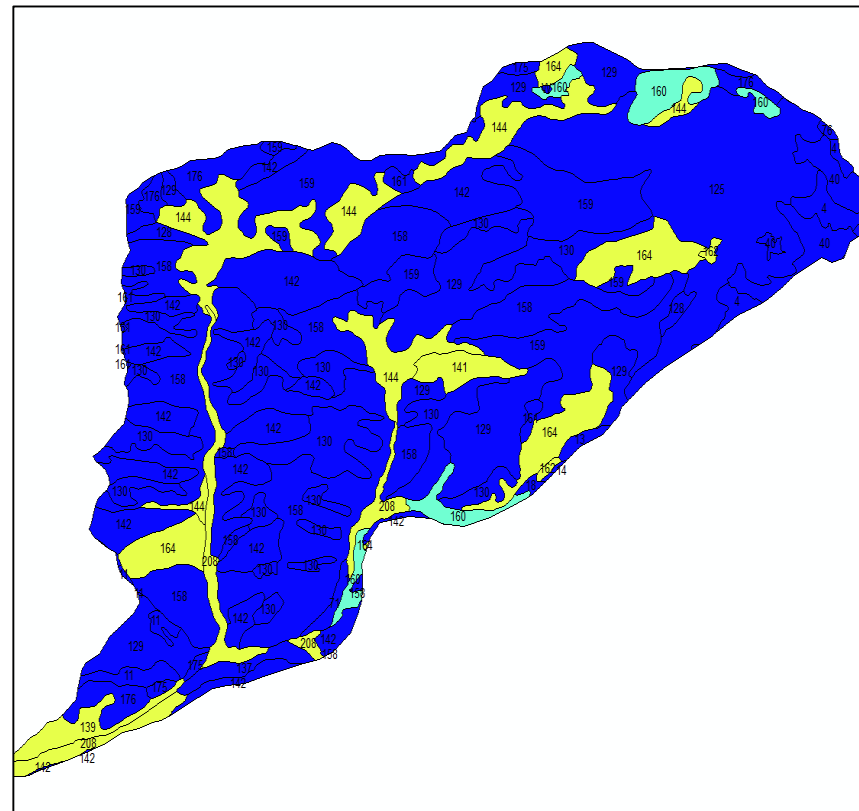


Fig. 20. Soil map units as they relate to water storage capacity. Aqua areas are wetland soil types, light green areas are soils with seasonal water tables.

Soils across the project area are derived primarily from residuum and colluvium from sandstone and siltstone with a thin layer of volcanic ash and loess in upper layers. There are minor inclusions of residuum and colluvium from basalt and bentonite. Soil textures range from ashy loams to sandy loams with low to high coarse fragment content.

Soil composition and texture have management implications. Volcanic ash on north, east, and west aspects occurs as an ash cap over a variety of parent materials. The potential for compaction with ground-based logging equipment is high to moderate. On southerly aspects, the ash is generally mixed with the underlying parent material due to geologic erosion. These soils commonly have a high percentage of rock fragments ranging from gravel to boulder in size. The potential for compaction is low to moderate. Displacement of duff and organic horizons, however, is a much greater concern because soil development is minimal.

Soil productivity in relatively young soils is dependent on the organic soil horizons for nutrient cycling and water holding capacity. Required mitigations and Region 6 Best Management Practices (BMPs) for ground-based yarding would be implemented to address potential risks to soil productivity.

Rock outcrops and talus slopes are common features across the planning area. In some locations open talus slopes are present with little to no soil development. On steep slopes, soils have formed in voids between talus rocks. They form small inclusions, generally less than 1 acre, and in places they support large trees. Some contain old skid trails, but they are not suitable areas for timber production or ground-based yarding operations. In today's logging operations, they would not be logged, but skyline corridors may pass through them.

Field Observations

Effects of past harvest / thinning activities were observed in proposed treatment units. Most units had entries since 1970. In some areas, primarily landings and old skid trails, there is still evidence of soil compaction. Ground based yarding was also noted on continuous slopes exceeding 35%, which would not occur under today's logging practices. Machine piling of slash and mechanical site preparation was also observed in the project area. This was a common practice prior to the mid 1980's (Meurisse 1987), but is no longer an acceptable management practice on National Forest System lands.

Compacted sandy loam to loam soils, which are the dominant soil textures across the project, have improved naturally in the surface horizons (top 0 to 6 inches). In some cases, subsurface compaction persists 6 to 12 inches below the soil surface. Natural recovery of subsurface compaction will continue over time through freeze/thaw cycles and root penetration. Field monitoring indicates that approximately 25% of historic skid trails identified in select treatment units have root limiting compaction considered to be detrimental to soil function.

The criteria used to determine direct, indirect, and cumulative effects on soil productivity is the percentage of area within an individual treatment unit where Detrimental Soil Disturbance (DSD) has occurred or is expected to occur from proposed activities. The current level of DSD across the entire planning area is approximately 2% for erosion, and 3% for compaction, due to previous timber/fuels management activities, past and current mining activities, roads, and some dispersed recreation (Table 3.1). The current level in individual treatment units ranges from 0 to 7% (Soils Specialist Report Table 1).

Table 3.1: Existing conditions for soils.

Resource Element	Resource Indicator	Measure	Existing Soil Condition (Alternative 1)
Soil Erosion	Detrimental surface	FSDMP w/R6 approach	2% of total area
	Detrimental mass wasting	FSDMP w/R6 approach	None observed
Soil Disturbance (compaction, rutting, puddling)	Ocular estimation (present/absent)	FSDMP w/R6 approach	3% of total area
OM, CWD, Ground Cover	Measured & ocular estimations made in each unit	FSDMP w/R6 approach	Adequate OM, some units short on CWD
Nutrient Cycling	Presence of OM, CWD, & ground cover	Unable to measure (samples need to be laboratory analyzed)	Adequate OM, ground cover

*OM = organic material; CWD = coarse woody debris.

Environmental Consequences

Direct and Indirect Effects

Alternative 1 - No Action

Indicators for soil (Table 3.1 above) would not change. The only difference would be the increased threat of severe wildfire and the potential damaging results of extreme soil heating due to excessive fuel loading in the project area.

Soil Erosion and Mass Movement

Current soil erosion and mass wasting regimes would not change. Natural and human-caused wildfires could affect soils in the Project Area, however by consuming protective litter and duff and/or creating a hydrophobic (water repelling) soil condition. These conditions may contribute to soil erosion. Based on slope structure and fine fragment content in most soils in the Project Area, the risk of erosion and mass wasting following a severe fire would be major. Colluvial activity may increase in areas where structural support from trees is lost; however, sediment transport would not occur on rocky slopes. As recently seen with the Carlton Complex, mass movement following high severity fire occurs primarily in the form of debris torrents within channels following high severity, short duration storm events.

Soil Disturbance

The level of detrimental soil disturbance would remain at low to moderate level across the planning area. The failure to address the ongoing high risk for severe wildfire, however, may indirectly reduce soil productivity. See the following section.

Organic Matter (OM), Groundcover and Coarse Woody Material

Over time, all standing trees (dead and alive) would shed needles and fine branches that would accumulate on the soil surface. Eventually, trees would fall to the ground, providing coarse wood for decomposition into the soil. Soil organisms would slowly decompose the organic materials, adding

beneficial humus to the soil. The primary source of soil organic matter is the decomposition of fine roots rather than the decomposition of surface organics (Powers et. al 2005). Nutrients associated with this material would slowly become available for plant growth. This process would continue until another major disturbance such as fire consumes or partially consumes the accumulated litter, duff, and woody material.

Fire severity exceeding the historic range of variability could have detrimental long-term effects on soil productivity and health through the oxidation and loss of soil organic matter and associated soil biota, as well as through accelerated rates of erosion (Harvey et al. 1987; Harvey et al. 1988; Hungerford 1995).

Nutrient Cycling

Microorganisms would continue to populate soils, and contribute to site productivity through nutrient cycling and development of soil structure aggregates in areas of poorly developed mineral soils. The occurrence of severe wildfire, however, may alter soil microbial communities by super heating mineral soils and consuming organic matter necessary for microorganism functions.

Alternative 2 - Revised Proposed Action

Soil physical changes (detrimental compaction, detrimental displacement, detrimental erosion, severe burning, and puddling) can persist in the landscape for greater than 20-40 years following management activities. Biological soil conditions change more quickly, for example re-vegetation occurs within 5 years (under most situations) and organic matter begins to rebuild in 10 years but may take greater than 50 years to reform humus.

Soil Erosion and Mass Movement

Prescribed fire, harvesting, and post-harvest operations would increase risk of soil erosion, but required mitigations (R6 BMPs, including leaving organic material on the soil surface, reducing the area impacted by skid trails, and maintaining the hydrologic function) would reduce the risk. Implementing specific erosion control measures such as water bars, placing slash on bare soils, and vegetating disturbed soils conserve would also conserve the soil resource. The volcanic ash mantle is highly susceptible to erosion; however, required mitigation measures and BMPs are designed to leave the organic layer and vegetation intact thus minimizing or all together eliminating erosion. The high coarse fragment content of the other soils found in the project area provides armoring against erosion. In some places, talus slopes and high surface rock content would prevent overland flow.

The project would not affect surface stability of talus slopes with shallow soils; therefore, the risk of landslide initiation as a result of forest thinning would remain low.

Risk of mass movement from prescribed fire is also very low. Prescribed fire is typically completed when soil moisture is high (greater than 80 percent) and weather conditions are cool and humid. Intense heating of the soil and complete consumption of organic soil horizons typically does not occur except in select cases where a log or accumulated fuel pile burns for an extended period of time. The probability of these small areas of disturbance altering slope stability is very low. It should also be noted that mature trees are typically not affected during prescribed burning. The rooting systems of mature trees would remain intact to provide surface stability.

Soil Disturbance

Summer ground-based harvest would reduce ground cover on heavily used landings and skid trails, by approximately 10% (Table 3.2). Old rehabilitated skid trails remaining from past timber harvest are present in some ground based units. These old trails have naturally rehabilitated and do not currently have detrimental soil conditions. They are difficult to locate in many areas. In order to minimize disturbance to soils that have never been ground-based yarded, old trails that are easily identifiable would be reused to the extent feasible.

Table 3.2. Effects of Alternative 2 on soils, by logging system

	Swauk Pine EA Proposed Yarding and Hauling		
	Summer Ground-based (Acres)	Skyline & Track-line (Acres)	Temporary Roads, TLM Trails, Exc. Skid Trails
Potential Soil Disturbance	+10%	+5 to 8% (Skyline - Feller/Buncher)	15 ft. wide x length of temp = disturbance ac.
Total Acres Treated			
Alt. 1	0	0	0
Alt. 2	470 ac	1,843 ac	x
Potential Acres of Additional Soil Disturbance			
Alt. 1 – Total	0	0	0
Alt. 2 – Total	47 ac	92-147 ac	x

The main soil concern for ground-based yarding is displacement of thin organic horizons and displacement of the volcanic ash mantle. On lightly used skid trails (one or two passes) ground cover would not be reduced along the entire trail length. Compaction of mineral soils may occur but is likely to be buffered by the medium to high percentage of coarse fragments found in many of the soil types in the project area. Constructing water bars, creating brush sediment traps, or seeding/planting forbs, grasses, or shrubs, would hasten groundcover recovery and reduce soil erosion and movement of soil off-site. Disturbed vegetation would re-grow in less than 5 years except where there is root kill.

Groundcover in skyline corridors would be reduced approximately 5-10 percent as a result of choker setting, cables, and removing logs from the site (Clayton 1985). In many cases, the displaced groundcover along the corridor occurs in small patches. These small areas (less than 100 square feet) of displacement are not considered DSD. Ground cover reduction would only occur along the corridor where log suspension is limited and numerous yarding passes occur. At landings, there would be additional reduction in groundcover due to equipment operations and corridor convergence.

After treatments, the percent of DSD in individual treatment units would range from 7 to 10%.

Organic Matter, Groundcover and Coarse Woody Material

A variety of organic matter would be left on site, and thus provide for microbes that help maintain site productivity (Harvey et al. 1994). Vegetation and organic matter protect the soil surface from raindrop

impact, dissipate energy of overland flow, bind soil particles together, and dampen soil temperature extremes and daily fluxes. Studies have found that 60 percent effective ground cover reduced sediment movement substantially and 30 percent ground cover reduced erosion by half compared to bare soil (Robichaud et al. 2000).

Coarse woody material (material greater than 3 inches in diameter) would persist in the form of designated leave trees, both standing and down, as well as limbs, and broken tops. Treated stands would recruit large coarse wood that contributes to soil development, at a faster rate than current conditions. The amounts of coarse wood listed in Table 3.3 for each Fire Group would maintain future soil productivity. The proposed commercial and non-commercial thinning treatments are anticipated to leave slash on the ground through the winter and into late summer/fall before prescribed burning will be completed. This will provide opportunity for the nutrients in the slash to be leached into the soil.

Table 3.3. Coarse Woody Material (CWM) requirements for soil productivity.

Fire Group	CWM
2 and/or 4 = Warm, Dry Ponderosa Pine and Douglas-fir Habitat Types	5 to 10 tons/acre
5, 6 = Cool, Dry and Moist Douglas-fir Habitat Types	10 to 20 tons/acre
7, 8, and/or 9 = Cool Lodgepole Pine and Lower Subalpine Fir Habitat Types	8 to 24 tons/acre

Any increase in groundcover and/or fine logging slash through harvest may be offset by fuel treatments. Fuels treatments may reduce the amount of organic matter and groundcover in the short-term (0-5 years after treatment) through the use of prescribe fire. In the long-term, re-growth of vegetation and annual needle drop would provide groundcover and leaf and litter material necessary for soil organic matter development.

Localized displacement may occur but is not expected to affect overall site stability, particularly when compared to large-scale losses from fire or erosion.

Nutrient Cycling

Nearly all proposed harvest would include whole tree yarding or leaving tops attached. Johnson et al (1982) reported that generally, as long as rotations are long, the depletion of the major nutrients needed by plants would not be excessive in relation to total reserves in the soil and that soils reserves would be replenished between cuttings, through precipitation, leaching, and nitrogen fixation by soil microbes. Nutrient cycling and availability would not be altered.

Because at least 85 percent of the site would retain organic cover, nutrient cycling and availability would not be altered. Localized losses may occur at landings or where severe fire occurs.

Cumulative Effects for Alternative 2

Effects of past and present actions on soils were described under above under Existing Conditions. There are no foreseeable planned actions that in combination with Alternative 2, would result in a cumulative effect to soils.

Consistency Finding for Soils

As designed and with implementation of all required mitigations and BMPs for soil, the expected level of detrimental soil disturbance that would result from proposed treatments under Alternative 2 would remain below 20% in all proposed treatment areas. Long-term soil productivity would be maintained, as required by the Forest Plan. No ground-based harvest would occur on slopes >35%.

Hydrology and Water Quality _____

Introduction

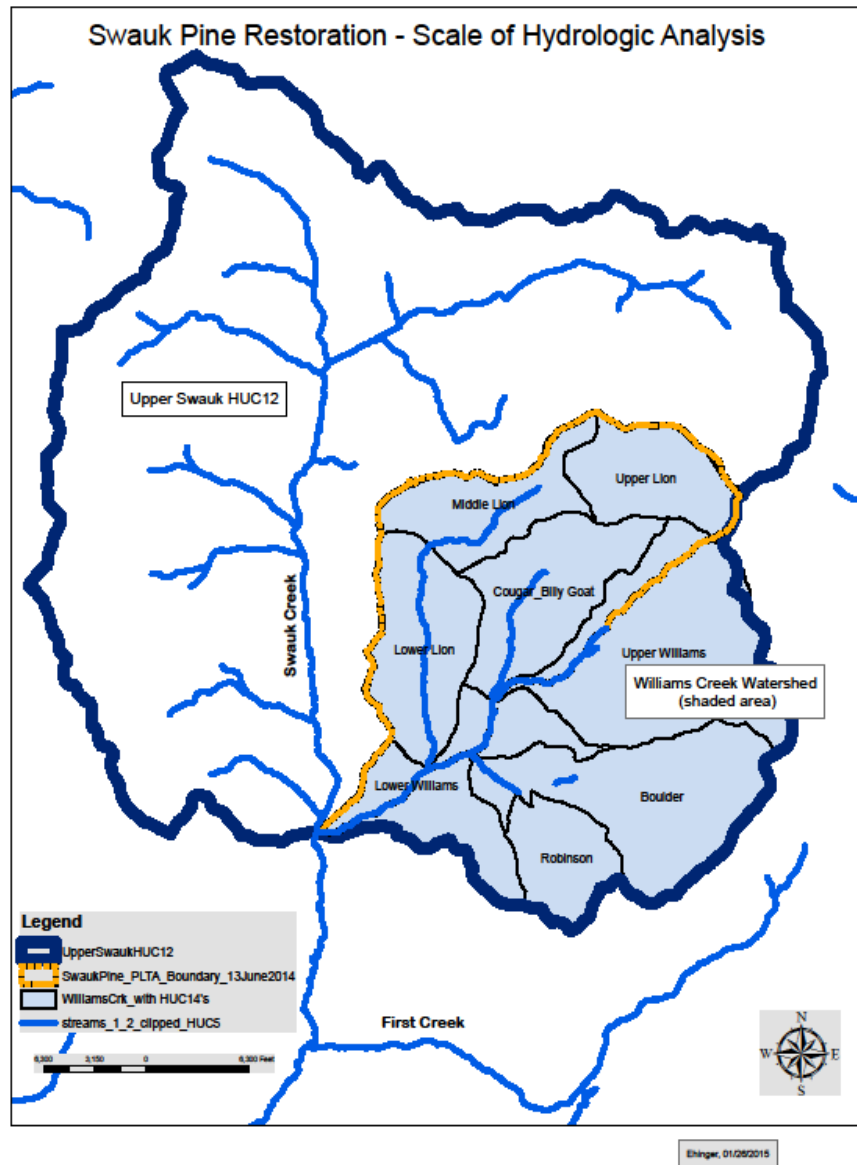
The project is located in the *Upper Swauk* 12th field subwatershed (Hydrologic Unit Code (HUC) 170300010501), within the larger *Upper Yakima River* 8th field subbasin (HUC 17030001). The HUCs are a national standard for delineating hydrologic unit boundaries for analysis.

The planning area encompasses approximately 6,500 acres or ½ of the entire Williams Creek drainage. Williams Creek is the southern boundary of the planning area. This is uncharacteristic to divide a watershed in this manner but was done for administrative reasons. Within the planning area there are portions of six (6) smaller 14th field HUCs; four (4) of which are wholly contained within the planning area and two (2) others, Lower and Upper Williams Creek, which are only partially contained. The HUCs listed in Table 3.4 and illustrated in Figure 21 provide context for evaluating environmental sensitivity, watershed responses, and environmental effects

Swauk Creek's watershed conditions and functions are a result of the current and past land uses and management actions, as well as all previous natural events and responses which have occurred over time. Past and current forest management actions and disturbances include road construction and management, logging activities including railroad logging, fuel reduction actions, sheep grazing, wildfires, recreation uses, including motorized trails, watershed restoration actions, and mineral exploration. Furthermore, the environmental effects of such actions and events depends upon the original magnitude and extent of the actions, the location and sensitivity of the watershed to the disturbance, and the duration of time which has elapsed since the disturbance last occurred. Together these represent a baseline condition for hydrology and water quality (peak and baseflow conditions, stream channel conditions, sedimentation, water temperature) within which this project is being evaluated.

The proposed actions for this project involve road construction and reconstruction, logging to restore stand structure and species composition, silvicultural thinning, fuel reduction activities, post-logging road management actions, and watershed restoration actions. This analysis will disclose the effects of these proposed actions to Hydrology (streamflow, wetlands, and floodplains), Stream Channels, Sedimentation, and Water Temperature.

Figure 21.



Watershed restoration actions are an integral part of this Swauk Pine Restoration Project. In 2010 an inventory of site-specific projects needed for restore watershed function, and riparian and aquatic health, was initiated. These projects involved restoring such functions as the hydrology flow regimes (peak and baseflow conditions within channels), stream channel/floodplain conditions (channel form, streambed and bank stability, connectivity with floodplains, water storage, water temperatures, longitudinal continuity); restore erosion and sediment regimes occurring outside of the stream channels (roads and 4 WD trails) as well as from within the channel streambanks associated with streambank disturbances (undeveloped recreation sites), and restore ground soil and vegetation disturbances impacting Riparian Reserve functions and objectives.

Methods and Scale of Analysis

Hydrology and Stream Channels

On-site field investigations were conducted and included examination of land-type associations, classification of stream channel types, identifying flow regimes, bed and bank characteristics, validation of soil characteristics important to hydrologic responses, identification of wetland features and shallow groundwater features and their conditions. Soil map units were screened to identify soils which exhibit high water storage capacities where water availability may be in excess of vegetation demands. These may represent areas where the effects of forest thinning may result in more water available for runoff; activating areas representing shallow groundwater/surface water connections.

A GIS spatial analysis of road locations within Riparian Reserves and road densities across the landscape was conducted using the Okanogan-Wenatchee National Forest transportation database. Watershed disturbances to runoff patterns, occurring from previous logging methods and the current road networks in Riparian Reserves were evaluated, including disruption of natural flow paths, floodplain function, stream channel stability, coarse woody debris accumulation and function, and wetland conditions and function.

Areas of past treatment similar to the proposed treatments were monitored. Over-story vegetation communities were characterized as 1) naturally open and unlogged in the last 30 years, 2) naturally open and logged in the last 30 years, 3) productive stands, unlogged in the last 30 years, and 4) productive stands, logged in the last 30 years. Naturally open stands are those, based on site conditions and fire return intervals, which would have supported fewer mature conifer trees per acre, and likely naturally exhibited an open canopy closure of between 20 to 40%. In contrast to this, more productive sites exhibited a capacity to support more trees per acre based on water availability and site conditions. This is exhibited by those mature stands which have not been logged over the past 30 years and demonstrate canopy closures of >60% and little indication of the stresses contributing to defoliation found in the more drier open and overstocked stands. The 2015 GIS owl habitat vegetation data, developed by the Pacific Northwest owl researchers, was used in this analysis. While it classifies vegetation habitat quality by canopy closures, those same distinctions in canopy closure could be used for analyzing watershed responses.

Baseline peak flows were calculated based on developing a weighted average watershed canopy closure calculated for each HUC 14 at various flood recurrence intervals, utilizing the USGS rational runoff equations. The acres in each baseline category were then modified to account for the acres of change to that canopy closure, as proposed in the commercial harvest polygon and silvicultural prescriptions. Peakflow were re-run to examine the magnitude of changes resulting from the proposed vegetation changes.

In the process of evaluating the baseline conditions, opportunities for restoring the hydrologic regime were noted and recorded in a GIS database.

Sedimentation

Analysis involved review of surface and mass wasting hazards, identified for soil types in the proposed stands, using the GIS spatial analysis of NRCS Draft Soil Survey of Kittitas County (NRCS, 2004). In addition, the Travel Analysis Process was used to evaluate road networks, using GIS spatial analysis

and field investigations for determining the soil erodibility hazards in those areas. On-site investigations also evaluated ground cover, landforms, streambank stability, and watershed disturbance elements which included abandoned skid trails, closed and open roads, stream crossing structures and road surface cross-drain structures and undeveloped recreation sites.

The USDA Forest Service, Water Erosion Prediction Project (WEPP) model for predicting erosion rates from roads and hillslopes was used to examine relative rates of soil erosion from a cross-section of road types and landforms (Elliott 2004).

Water Temperature

The analysis involved assessing current and historic water temperature monitoring data, determining the predominant sources of streamflow during summer discharge period, and evaluating the risks to water temperature increases due to modifications in canopy cover in Riparian Reserves.

Water temperature monitoring was conducted in 2007 through 2014 within the analysis area. Continuous data recording of water temperatures was conducted on tributaries in stands targeted for thinning within the analysis area, sampling both the steep gradient, confined perennial streams as well as lower gradient, unconfined groundwater dominated flow regimes.

Examination of maximum water temperatures in conjunction with maximum air temperature identifies water temperature vulnerabilities to increases in air temperature and reductions in canopy density. Surveys of disturbance include review of previously harvested stands and existing road locations in Riparian Reserves, where the removal of mature forest canopy has sustained an artificially low canopy cover (shade) within these areas. Miles of road in Riparian Reserves can serve as a relative indicator of vulnerability of a waterbody to sustained higher water temperatures during seasonal maximum air temperature and short-wave radiation.

Regulatory Framework

An abbreviated list is shown here. For additional details, see the Hydrology Specialist Report.

Wenatchee National Forest Land and Resource Management Plan (USDA 1990): –

- Hydrology: pages IV-85 through IV-88;
- Stream Channels Morphology and large woody debris: Pages IV-86 through IV-88.
- Sedimentation and Water Quality:
 - The Clean Water Act (CWA), as represented collectively by The Water Quality Act of 1987 (PL100-4), The Clean Water Act of 1977 (PL95-217) and the Federal Water Pollution Control Act Amendments of 1972, is reflected in the Okanogan-Wenatchee National Forest Plan Water Quality Standards and Guidelines (page x).
 - *Fine Sediment, Macro-invertebrates and Turbidity*: Turbidity standards for Class AA water bodies shall not exceed 5 NTU over the background turbidity when background levels are 50 NTU or less *page IV-86*;
 - Forest direction to implement the State of Washington's *Water Quality Standards for Surface Waters of the State of Washington* (WAC, Chapters 173-201A), as direction for conducting land-use activities and protecting water quality. Forest Plan Standards and Guidelines for the protection of water temperatures (USDA 1990, pg. IV-86) documents

the water temperature standard as a “maximum daily temperature of ≤ 61 deg F. and an average 7-day maximum temperature of ≤ 58 deg. F.

- The state standard was revised in 2006 as follows: “Water temperature shall not exceed 60.8 deg. F (16 deg. C) due to human activities. When natural conditions exceed 16 deg. C, no temperature increases will be allowed which will raise the receiving water temperature by greater than 3 deg. C.”

Northwest Forest Plan:

- ACS objectives 1-9;
- Timber Management Standards TM-1 (a, b, and c). (Prohibit timber harvest, including fuelwood cutting, in Riparian Reserves, except as described in the 1994 ROD.
- Road Management Standards RF-2 (a, e, and g), RF-3 (a and b), RF-4, and RF5. Culverts should accommodate at least the 100- year flood), minimize sediment delivery to streams from roads).

Laws, Regulations, and Policies

- Executive Order 11990 Wetlands
- Executive Order 11988 Floodplains
- Clean Water Act
- The 2000 *Memorandum of Agreement* between Washington State Department of Ecology (Ecology) and the Okanogan and Wenatchee National Forest established a framework for bringing forest roads into compliance with the Clean Water Act within a 15 year timeframe. That agreement is still in effect.
- In 2003, Ecology completed a Total Maximum Daily Load (TMDL) report for the Wenatchee National Forest to address water temperature impairments (Whiley et al. 2003). The report established the required pollutant reduction (defined in terms of acceptable shade loss along streams), to achieve the water quality standard for each impaired stream, based on its geologic zone, size of the drainage area, and forest vegetation group.
The EPA regulated target shade level for Swauk Pine streams is “70% Total Effective Shade”. This standard must be met to fulfill requirements of Section 303 part (d) of the Clean Water Act.

Existing Conditions

Hydrology

Elevations range from 2400 ft. to the lower end of Williams Creek to the 6000 ft elevation along the eastern edge of the planning area at Table Mountain. Average annual precipitation ranging from 20 to 30 inches across the project area on a gradient from west to east with the highest precipitation zones occurring at the eastern perimeter

Approximately ½ of the planning area is dominated by structurally controlled bedrock and surface geologic materials which include tertiary continental sediments (Swauk Formation) and Columbia River flow basalts. This contributes to relative steep and continuous slopes, highly dissected by 1st order streams with broad valley bottom floodplains and riparian areas. These conditions naturally route water rapidly to valley bottoms. This includes the HUC14s of Lower Lion, portions of Middle Lion, Lower Williams, and all of Cougar Gulch /Billy Goat Gulch.

The other ½ of the PLTA area is dominated by large ancient landslide landforms occurring along the eastern and upper elevations of the PLTA; predominantly in the majority of Upper Lion HUC14 and lesser portions of Middle Lion HUC14. This geologic setting results in hummocky shaped hillslopes, less channel dissection, shallow groundwater tables, higher water storage potential and less rapid runoff. These include higher natural water holding capacity in the soils and increased shallow groundwater storage and fewer stream channels per acre of land, important factors to consider when planning for vegetation thinning and changes in the water balances on hillslopes.

The PLTA includes four precipitation mechanism zones (rain, transient snow, rain-on-snow, and snow dominated). Below 4000 feet in elevation rain-on-snow storm events are common. These storms contribute to rapid melt and loss of the snowpack and concentration of runoff on roads and within unstable stream channels. These storms are characterized by heavy rainfall over a six (6) to 48 hour period on top of a warm saturated snowpack, with high winds. In the past 20 years, the frequency of occurrence of rain-on-snow storm events has increased in the Swauk watershed, and the timing of the annual snowmelt runoff has moved earlier by as much as 3-4 weeks.

Historically, peakflow discharges from snowmelt runoff were variable and came in early to mid-May. In recent years, that snowmelt event has come as early as February and rarely later than mid-April. What has changed is that it now typically comes as a dual peak runoff; the first being a rain-on-snow flood event which represents a significant portion of the snowpack below 3500 feet elevation, followed by a second spike in discharge coming later due to clear-sky spring warming.

Effects from Roads and Trails

Extensive forest road and 4WD trail networks, and past logging and ground-based skid trail construction within Riparian Reserves have resulted in soil compaction and the alteration of natural flow paths which have changed runoff paths, increased velocities in streams and changed the timing of runoff within the watershed. These roads are referred to as “*hydrologically connected*” roads, which are recognized in research as extensions of stream channel networks.

Currently there are over 29 miles of “*hydrologically connected*” roads and 4WD trails in the PLTA. This is an extremely high number when expressed as a density on the landscape. Those densities are 9 miles per square mile, and range from a low of 4 miles per square mile in Upper Lion to over 10 miles per square mile in Cougar/Billy Goat, Middle Lion Gulch and Lower Williams.

Overall road densities within the Swauk Pine PLTA and the Upper Swauk Creek HUC 12, are 8.0 and 4.4 miles per square mile, respectively. These include unauthorized roads and unauthorized 4WD trails, and closed roads which were not effectively closed according to policy or for watershed resource protection. This is an extremely high watershed disturbance level in the PLTA and moderately high in the Upper Swauk as research suggests that road density levels in excess of 2.0 miles per square mile are common thresholds for initiating watershed responses in environments such as the Swauk Creek watershed. These densities are contributing to increased concentrations of water delivered to downstream channels, increased velocities, amplified flood peakflows and reduced riparian water storage and lower late summer baseflow discharges. In conjunction with vegetation cover changes, this condition is likely contributing to advancing the timing of peak runoff in these drainages.

In many places, roads and mechanized skid trails were constructed directly on top of stream channels, riparian areas and floodplains along streams. This destroyed many small 1st order intermittent and

perennial stream channels and wetlands, removed large woody debris, displaced the surface organic and mineral soils, and compacted the subsoil.

Effects from roads include interception of seasonal and perennial streamflow and shallow groundwater. In places the roads constricts the stream channel on its floodplain, prohibits overbank flooding and the recruitment of large woody debris. The effects included those stated above and diminished cold water refugia from the loss of shallow groundwater recharge/discharge. Examples include 9718-000, unauthorized road UA65 and 9718-118 in the *Cougar/Billy Goat HUC*, (see priority list with High/Moderate ratings). See Stream Channel discussion for additional effects on channel erosion and large wood.

In other cases, roads cut across steep hillslopes and bisect streams at crossings. At these locations the road effects are similar to those above but it is the road cutslopes, ditchlines and surfaces which are intercepting upland hillslope runoff and groundwater seepage zones contributing to changes in flowpaths and increasing the efficiency of routing to streams; cumulatively contributing to excess energy in stream channels with delivery through stream crossing culvert inlets. Examples include both FS System roads and unauthorized roads including FS Road 9712-000 where there are 3 groundwater seepage areas intercepted by the road within 0.75 miles along the road, 9712-115, 9718-000 (See Sedimentation discussion on mass wasting) (see priority list with high ratings)

Road and 4WD trail decommissioning, relocations and road/trail drainage improvements which focus disconnecting ditchflow and surface runoff from streams and streamflow, are actions which contribute to improved conditions.

Effects from Past Treatments

The Swauk Creek Watershed Analysis (Cle Elum Ranger District 1997) identified the area within the PLTA and Upper Swauk HUC 12 watershed as experiencing extensive mechanized logging "...which didn't peak until the mid1940's through the 1980's." Based on an analysis of historical logging, by 1996 the majority of the drainage area within Lion Gulch and Cougar Gulch subwatersheds had been logged, with 73% and 98% of their area logged, respectively. This does not include the railroad logging through the 1930's.

Various research has looked at watershed responses to logging and have established that conifer stands which are less than 30 years old, with canopy closures of less than 40%, which affect 20% or more of the total watershed area contribute to changes in flow regimes and peak flood events. These open stand conditions contribute to more snow accumulation within openings and increase exposure of snowpacks to rapid melt during rain-on-snow storm events; contributing to elevated peak flow discharges. Areas of historical logging have been analyzed within the PLTA, relative to stand age, stand structure, canopy closures and environmental variables.

The following table demonstrates the spatial extent and distribution of past harvest occurring over the last 30 years in HUC14's within the PLTA and within Williams Creek. Several HUC14's have approached or exceeded the 20% of the total drainage area affected by this, with the distribution of that logging heavily weighted toward logging productive stands which can naturally support more dense canopy closures. Logging of these more dense stands, where site conditions can support a dense stand structure, presents a greater departure hydrologically from historic conditions than thinning more

overstocked, historically open stands. This emphasis in past logging has altered hydrologic conditions within the watershed.

Table 3.4. Extent of previous harvest activity in the Swauk Pine Planning Area, by Hydrologic Unit Code (HUC), and by hydrologic condition (dry-open and “productive”, that is, dense-mesic or moist).

HUC	% Harvested Since 1985	% of Total Acres Harvested by Potential Stand Canopy Closures (cc)	
		Dry Open (25-30% cc)	Productive (>50% cc)
Lower Lion	19.3	34	66
Middle Lion	20.3	11	89
Upper Lion	8.0	42	58
Cougar/Billy Goat	15.2	15	85
Lower Williams	42.4	25	75
Upper Williams	4.5	25	75
Boulder	14.8	17	83
Robinson	27.6	24	76
Total Williams Creek	17.3	29	71

Past logging and the removal of mature forest canopy cover has reduced the historic forest cover in the PLTA from 50% to 80%+ canopy cover, in many areas, to a current forest cover of 25% to 54% (weighted averages for existing forest cover for HUC14s). The historic forest cover of focus here is not the naturally more open stands within the PLTA, which were historically more open due to site conditions and fire return intervals. The effects discussed below are focusing on those stands which, due to environmental variables, had dense canopy cover either in clumps or patches defined by those variables. Past harvest prescriptions, prior to 2010, did not differentiate in the silvicultural treatment between these two different groups. Canopy changes occurring due to logging in those more dense stands contributed to a flashier watershed response to snowmelt and stormwater runoff.

Observed hydrologic changes include reduced interception of snow and rain in the forest canopy due to a more open forest canopy, increased accumulation of snow on forest floor in openings in the forest canopy, exposure of that snowpack to rain-on-snow storm events, increased rates of snowpack ablation, shorter duration of snowpack retention, and likely increased peak flow discharges in streams during rain-on-snow storms.

The increase in the concentration and timing of the available runoff (flashiness) is a function of changes in the storm types (snow dominated vs. rain-on-snow), their magnitude and frequencies, and change in the routing of that runoff from pathways which were historically a natural forest floor where infiltration could occur, to pathways represented by compacted soils on road and trail surfaces.

Climate change scenarios for the Pacific Northwest's Cascade Mountains project a transition to less snow-dominated storm events throughout the winter months with increased occurrences and magnitude of rain events. This means more rain-on-snow events for the Swauk Creek watershed. This projection makes managing canopy closures through thinning appropriately for snowpack accumulation and retention which mimics the natural diversity in stand characteristics

Effects from Previous Harvest

In addition to watershed scale responses, there are site-specific, natural characteristics within stands which represent fine-scale diversity and hydrologic function across the landscape. When vegetation and soil conditions in these areas are modified it can contribute to changes in hydrology at both a local and cumulative scale. These areas are defined as *contributing source areas* and consist of shallow groundwater flowpaths (interflow) and seasonal surface runoff paths such as swales and ephemeral drainages. These represent extension in the stream network, and areas of shallow groundwater storage and release as baseflow discharge which support late season flow in streams and buffer water temperatures during warm weather.

Contributing source areas can be identified within the PLTA through a combination of variables which includes landforms, soil types, aspects, precipitation zones, hillslope shape and position on the landscape (swales) and plant communities. In combination, they indicate available soil moisture (available water supply) in excess of vegetative demands, at a site scale.

Soils identified as having a naturally high available water storage (approximately $\geq 15''$ AWS) are a very important component of source areas (see Soils section). These are sites where water is not a limiting factor to vegetation health and stand resilience. Stands growing on these sites historically had higher stocking levels and denser canopy covers. While source areas can encompass an entire stand, in many areas they are only inclusions within larger stands and can be found in both upland and riparian locations.

In a functioning watershed, commercial thinning in contributing source areas is more likely to increase short-term water yields by increasing the volume of water in excess of vegetation demand released from these areas. Since water is in excess of stand needs, it becomes infiltration, interflow, shallow groundwater, and eventually surface runoff or streamflow. In functioning watershed, this water may be considered a short-term benefit to stream, aquatic resources and downstream water users, because it augments baseflow and mitigates warm summer water temperature with cool inputs of groundwater. In watersheds degraded by road densities and locations, channel and wetland alterations, and riparian soil compaction, however, the natural flow paths have been altered, as has the natural water storage capacity of the watershed.

Past disturbance in the Swauk Pine Project Area have modified contributing source areas. Any additional water released from these areas, including available water which may be generated by thinning, may be routed artificially off the landscape. The potential short-term benefits of this increase in water availability may be quickly lost. Thinning activities which do not account for these unique

source areas and altered watershed flowpath may actually contribute to cumulative watershed effects by excessively thinning forest crown closures from a watershed response perspective. Managing stand vegetation crown closures in these areas, upslope of altered stream channels and areas of disturbance such as roads is one way to minimize risks of generating rapid runoff downslope onto roads and trails and streams.

To characterize stands which contain this fine-scale diversity, the environmental factors previously identified were combined and field validated. Original stands identified as containing these conditions included 24 individual stands or portions of stands totaling 564 acres. (See Hydrology project file).

Based on the conditions in the watershed, including extent of past harvest, extent of road network and road locations, and conditions within stream channels, 564 acres of source area were identified as needing a modified silvicultural prescription to protect fine scale diversity structure and retain more mature trees (at least 50% canopy closures in clumps and patches. (See Hydrology files and Dec 2014 memo to Silviculturist and marking crew).

Effects to Peakflow and Runoff

HUCs of concern at the landscape scale include Lower Lion, Middle Lion and Cougar/Billy Goat HUC (see Table 3.4). A widely acknowledged threshold of concern for percent change in peakflow magnitude is 10 to 20%, or more. These values are linked to changes in in-channel erosion.

Peak flows in Lower Lion Gulch currently exceed the historic level by a percentage which exceeds the threshold values for expected changes in channel conditions and cumulative effects.

Outside of stream courses, mechanized ground-based logging was conducted on slopes as steep as 50%, beginning with the availability of surplus caterpillar tractors following WWII. This form of disturbance extended through the early 1980's on excessively steep slopes (Cotton 1996). It resulted in soil compaction and loss of organic soil horizons that is still evident today from disturbances that occurred several decades ago. In these locations hillslope snowmelt and stormflow are intercepted and converted to overland flow; routed to altered stream channels where it efficiently leaves the watershed and contributes to diminished water storage capacity. In many places there is also an erosion component to this response (See Water Quality) (see headwaters of Cougar off of FS road 9718-112, Billy Goat Gulch, and Lower Lion).

Effects from Past and Present Dispersed Recreation

Dispersed recreation (access routes and campsites) in some riparian areas have severely damaged soil properties, vegetation and hydrologic function in these areas, including areas along Lower Lion Gulch, off of FS Road 9712-000, and Cougar/Billy Goat Gulch along FS Road 9718-000. As many as 12-15 of these sites are located along streams in the PLTA. Use has resulted in 30 to 60 % of the riparian acreage associated with a campsite exhibiting detrimentally compacted, rutted or denuded soils during the growing season.

In some cases, unauthorized OHV use has been a chronic problem where motorized vehicles are fording creeks. These valley bottom areas were historically moist riparian forests and meadow with seasonally perched aquifers adjacent to stream channels, along its edge. The meadow aquifers were recharged seasonally by winter snowpack and snowmelt. Now these areas have lost much of their shallow water storage capacity and road drainage designs have altered the hydrology which once fed the meadows.

Channels downstream have degraded and has lost much of their baseflow discharge. Meadow restoration and removal of human disturbance in localized areas is recommended along with modifications to the road access in these riparian reserves.

Small Wetlands

National Wetland Inventory (USDI, 1991) mapping is the basis for landscape scale wetlands mapping, however, field investigations throughout the PLTA identified a considerable number of additional unmapped smaller wetland complexes of 1/8 acre in size. Additional delineation is necessary prior to timber sale unit layout and cruising to establish adequate protection on Sale Area Maps.

Historically, small wetlands played an important ecological role in the PLTA, with beaver dams influencing hydrology and water storage (Engstrom 1997). Today there is little to no sign of beaver-created wetlands. Wetlands which are still functioning, yet impaired, are generally located at confluences of small tributary streams or along streams which have not incised in their floodplain and still experience overbank flooding which support the hydrology. Many are severely degraded due to the contributing factors previously discussed which alter natural flowpaths. Many of the conditions can be reversed with restoration of natural flow paths for snowmelt and storm runoff.

Stream Channels

The stream drainage network includes Williams Creek, Lion Gulch, Cougar Gulch and Billy Goat Gulch, with several small tributary streams that drain hillslope and headwater areas. Fish bearing perennial streams include Williams Creek, Lion Gulch, Cougar Gulch, and Billy Goat Gulch. Many of the stream miles are intermittent, however, those which may have been perennial have had their flow regimes degraded from past disturbance.

Stream densities for all HUC14 are relatively high at over 6 miles per square mile, with exception of Upper Lion Gulch where streams are forming in different surface geology. What this means is these drainages with over 6 miles/sq. mi. have naturally high drainage networks and high efficiency in movement of water and sediment.

Stream channel morphology is strongly influenced by surface geology, landtypes, valley bottom configurations, channel gradients and past human disturbances in the watershed. There are 3 broad zones.

- Moving from east to west, the Columbia River flood basalts, along with the deep-seated landslide deposits, dominate the Upper Lion Gulch HUC. They provide a signature of coarse angular bedload and bank materials interbedded with weathered clay sediments which support shallow groundwater features and wetlands along stream reaches. These bedload and bank materials are capable of energy dissipation and generally good streambank stability to the system. Channel gradients are generally ranging from 4 to 12%, with some steeper bedrock controlled segments.
- Moving west into the Upper 1/3 of Cougar/Billy Goat and Middle Lion HUC, channels are still influenced by the deep seated landslide but are transitioning to landtypes of the steep, folded and highly dissected Swauk Formation with dipslope /scarp landtype formations and valley fill sediments eroded from both the basalt and the Swauk Formation. These areas still show the signature of the landslide characteristics to the east.

- The third area is the steep, folded and highly dissected Swauk Formation with dipslope /scarp landtype formations and valley fill sediments eroded from both the basalt and the Swauk Formation. This area has wide ranging stream channel gradients; generally 1 to 4% in valley bottoms, moving to 8-12 % at midslope, with some in headwaters over 25%. Headwater channels are generally confined, stable channels with small boulder bed and banks, while meadow and valley bottom streams gradients transitioning to 1.0 to 3.0 % slopes along lower Lion Gulch, Cougar and Billy Goat Gulch, with extensive lengths of unstable channel, both vertically and horizontally. This is one area most vulnerable to changes in hydrology, both from its location in the watershed and the degraded conditions of the channel and floodplains.

The history of railroad logging in Lion Gulch, followed by road construction up the bottoms of Lion, Cougar and Billy Goat Gulches resulted in extensive stream channel confinement in locations. These are now abandoned roadbeds which reduce the cross-sectional area of the floodplain which is available to the stream. The cumulative effect in the channel's response to this loss, in conjunction with the increased delivery of water, has resulted in a major destabilization of channels, disconnection of streams from their historic floodplains and active in-channel erosion and sediment production.

- Road crossing culverts for stream channels are undersized for the hydrology and flow regimes currently, throughout the PLTA. This results in water which enters the pipe being concentrated and accelerated in velocity as it passes through the pipe. At the outlet, the force of the water causes extensive streambed scour and streambank erosion. In some cases the original installation of the crossing pipe elevation and grade led to a response in the channel at both the inlet and outlet, resulting in channel degradation and a perched pipe, or drop at the outlet. These represent restoration opportunities for channel conditions and Aquatic Organism Passage.
- LWD is critically important in this watershed as a means of dissipating stream energy, storing sediment, maintaining localized stream gradients and connecting streamflow with floodplains. Perennial and intermittent channels are severely degraded due to an absence of functional woody debris including large woody debris (LWD) and an excess of stream power and energy, in these highly altered hydrologic regime. There are localized stream reaches with effective stream energy dissipation where basalt parent material contribute cobble and small boulder streambed and bank materials, and where channel gradients >4%. However, in other areas of the PLTA stability is provided by LWD and streambank vegetation. The two work hand in hand. However, LWD is severely limited in those perennial streams within Lower Lion and Cougar/Billy Goat HUC14's. Streambanks have been destabilized by loss of vegetation and LWD making them prone to streambank erosion.

Currently, the Lower Lion, Middle Lion, Cougar/Billy Goat and Lower Williams HUC14's are deficient in wood numbers, diameters and lengths, and distribution. Larger size classes of wood (>24" dbh) are either absent or are not well distributed throughout both mainstems of Lion Gulch and Cougar/Billy Goat Gulches. The most obvious response to the absence is that channels become entrenched (vertical erosion of streambed). This is so severe in places that evidence indicates what were likely perennial streams have now been converted to intermittent stream types. This occurs from a lowering of base streambed elevations and exposing streambanks to draining adjacent wetlands and floodplains. Wetlands and shallow groundwater features adjacent to these channels

would have contributed sustained flow for longer throughout the water year in support of a perennial channel. These areas are now disconnected from the stream; located high in elevation above the current streambed.

The absence of small to large woody debris in smaller headwater stream channels combined with alteration of channels by log skidding, combined with past increases in peak flows from road and trail networks and timber harvest, has resulted in impaired functions of intermittent channels. Many of the proposed restoration projects in this project have the restoration of the stream channels and hydrologic regime as their principal objective.

Sedimentation

Several erosion processes have been well documented within the planning area. While turbidity measurements have been taken in the past, visual inspection of the land during and following storm events over the past 20 years have provided the best information on rates and locations of soil erosion and sediment delivery from a number of disturbances.

- Soil types are predominately sandy loams to stony loam textures which exhibit a high surface erosion hazards across the project area. Hazard ratings range from *moderate* to *very severe*; trending to the higher ratings as slopes exceed 30%.
- Stream densities range from 4.6 to 7.4 mi. /sq. mi. which is extremely high, making risks of erosion and sediment delivery to streams, and transport downstream to aquatic habitat highly likely. This includes overland flow and delivery of eroded soil directly to a stream. Headwater streams and riparian areas, particularly those with legacy skid trail disturbances, show signs of surface soil erosion and transport to streams.
 - Overland flow from within stands to a road ditch or road surface was observed. This resulted in concentration of runoff, accelerated runoff from the road and sediment delivery to a stream.
- Fine sediment sources have been identified originating from road surfaces at stream crossings, from ditchlines and cutslopes, motorized trail surfaces (4WD) and from within stream channels due to severe streambank erosion. Sources from road surfaces and cut and fill slopes are generally associated with the absence of effective BMPS.
 - Sediment loads, as evidenced by fresh bar deposition within the channels following flood events, appears to be exceeding the background erosion rates by over 50%. Suspended fine sediment levels were observed to be relatively high during annual bankfull runoff events. Lion Gulch and Cougar/Billy Goat HUCs exhibit a relatively high suspended sediment load.
 - Road surface and in-channel streambank erosion are the greatest cumulative contributors to the problems. Turbidity and fine sediment delivery has been linked to the combination of road surface runoff, mass wasting of road prisms, in-channel erosion processes from unstable streambanks, and localized physical streambank vegetation damage at undeveloped recreation sites, streambank damage from mineral explorations, unauthorized motorized vehicle uses in Riparian Reserves and localized effects from sheep grazing.

One large contributor of sediment to streams has been associated with undersized stream crossing culverts which become plugged and damage roads, either by diverting flow onto roads and ditchlines or occurring at the pipe outlet where high velocity flows are discharged and scour the streambed and banks immediately downstream. Undersized stream crossing culverts are common across the PLTA, with few sized sufficiently to pass the 100 year flood event.

- Over 40 % of all road and 4WD trail surfaces are located within the Riparian Reserves, which is 1 mile in the riparian area for every 2.4 miles located upland (29.6 miles riparian to 72.7 miles total. This is extremely high. These locations typically have insufficient vegetative buffers to effectively receive runoff and trap fine sediment, so it is delivered directly to stream channels.
- For the six HUC 14's making up the PLTA there are a total of 250 stream crossings in 72.7 miles of road, or approximately 3.4 crossings per mile of road/4WD trail. These range from a low of 16 crossings in *Lower Williams*, to highest values in *Lower Lion* and *Billy Goat Gulch* of 75 and 69 crossings, respectively. In the entire Williams Creek subbasin there are a total of 348 road/stream crossings. These road/4wd trail stream crossings pose the greatest risk for surface soil erosion and sediment delivery to a stream as the majority of these crossings (nearly 80%) are on steeper headwater stream channels where sediment transport is highest.

Using the Watershed Erosion Prediction Project (WEPP) model developed by the USDA Forest Service Rocky Mountain Research Station we can estimate the amount of sediment leaving a road buffer and entering a stream for a particular road design (USDA, 2010)

- Three different riparian road scenarios were developed which included variations in road surface, road grade and conditions. Assumptions were developed based on field survey which indicated that 20% of the riparian road/trail miles are channeling surface runoff or ditchflow to a stream crossings, had undersized crossings and capable of higher erosion rates, 40 % were moderate risk and 40% were low risk.
- Model outputs for annual pounds of sediment leaving each crossing over a 5 year period range from 120 lbs/year at low risk crossings, mostly from cutslope and ditch erosion, to 1300 lbs/year from high risk crossings; representing combined ditch, cutslope, fillslope and surface erosion. When these erosion outputs are applied across all 250 crossings proportionally to risks, the annual sediment leaving roads is approximately 50 tons or the equivalent of over 5 dump truck loads leaving the roads and trails and moving through the streams and watershed.
- Large fine sediment deposits are frequently observed in Lion Gulch, Cougar and Billy Goat Gulch and Lower Williams Creek. Examples include streambeds adjacent to road crossing culverts at Forest Roads 9712-113, 114, 209 and 210.
- Previously closed roads, unauthorized roads, and 4WD trails (both system and unauthorized) adjacent to streams or crossing streams are chronic sources of fine sediment from surface soil erosion. (9712-204, 9712-128, 9712-210, 9718-210 as examples of closed roads).

- Reduced road maintenance dollars have resulted in degraded and non-functional BMPs for road surface drainage on Maintenance Level 2 roads. This is particularly a problem on approaches to stream channel crossings (examples).
- Dispersed recreation sites and unauthorized motorized vehicle use along Lion Gulch and Cougar Gulch are considered significant contributors to streambank instability and in-channel erosion. Lower Lion Gulch has become a problem with unauthorized 4WD riding across a riparian meadow and through Lion Gulch stream channel. Restoration efforts in 1997 which modified undeveloped campsites resulted in localized improvements with increased riparian vegetation, some increases in retention of smaller woody debris in-channel (energy dissipation and sediment trapping), reduction of soil compaction and increased streambank stability. However, several problems have developed over the past 5 year with repeated damage to restoration work and re-opening of unauthorized roads and continued damage to resources from OHV use. There are several locations identified in the proposed restoration project list which propose modifying sites or eliminating motorized access to sites to achieve the sediment reduction and channel restoration objectives (Figs. 13 and 14, Chapter 2).
- Sediment erosion, transport and deposition is presently occurring at a rate which is above the natural or background erosion rates for a watershed of this geologic material and it is occurring in large part from within the stream bed and streambank. This is due both to the physical alteration to channels from a number of land use disturbances as well as from the energy of shear stresses applied to the channel from streamflow and cumulative effects of amplified peakflow discharges from logging and road building of the past.
 - Mineral exploration which disturbs the streambed and streambank makes the channel vulnerable to accelerated erosion during peak storm runoff and flooding. Activities which occur on the streambank by prospectors has resulted in the degradation of the soil and vegetation conditions at the site (soil compaction and damage or removal of riparian vegetation). These generally have an indirect effect of changing conditions which allow surface erosion and delivery of fine sediment during storm and snowmelt runoff.
- Sheep grazing, specifically the trailing of the band through Riparian Reserves along perennial streams has contributed to damage to streambanks in the past, along Lion Gulch. Damage consisted of vegetation removal and hoof damage which collapses banks, both of which contribute to increases in sediment loads and destabilized banks with lateral channel migration. However, for several years the route and direction of trailing was managed so that the band moved past vulnerable sites yielding improvements in riparian vegetation conditions. In recent years the monitoring had been discontinued and so we have little information to on current vulnerability of these reaches in lower lion gulch
- Deposition of sediment from these elevated erosion rates is contributing to the filling of pool habitat and has diminished the frequency of pools and depth of pool habitat, while embedding spawning gravels in pool tails and riffles with fine sediments.

Water Temperature

- The Upper Swauk Creek (HUC 12) is water temperature sensitive and is listed as “water quality impaired” for water temperature on the 2004 Washington State Department of Ecology’s 303d list, due to multiple exceedances of State water temperature standards.
- Water temperatures were monitored continuously throughout the summer season near the mouths of both Lion Gulch and lower Williams Creek. Both sites exceeded the State standards, which are the Forest Plan Standards as well. In Lion Gulch water temperatures monitored from 2002 to 2009 exceeded State Standards for the daily maximum in 4 out of 7 years sampled and exceeded the 7 day average daily maximum on 6 out of 7 years sampled.
- Water temperatures frequently exceed Forest Plan Standards during specific heating periods during the summer months. Looking at the Forest’s data specific to Swauk Creek sites indicates a correlation between when the State standards are exceeded and specific periods when the range between diurnal maximum and minimum air temperatures is narrowest. When maximum daily air temperatures exceeding 70 deg.F for five (5) consecutive days and the corresponding nighttime minimum air temperatures remain high, (above 50 deg. F) temperatures exceed state standards. While this is not the only condition which triggers water temperature exceedances, it does indicate a vulnerability of this watershed to sustained high ambient air temperatures. This would be in addition to the better documented responses to short-wave radiation inputs where canopy closures are open and allowing sunlight to strike the water surface.
 - Small streams and tributaries are particularly vulnerable to water temperature increases due to low volumes of water associated with their summer flow regimes.
- These conditions in conjunction with a reduction in mature riparian canopy closure from historic conditions as well as the deficiency in LWD have contributed to an overall higher sensitivity of streams to elevated water temperatures. Accumulations of large woody debris provide floodplain connectivity by facilitating overbank flooding, water storage on the floodplain, and shallow groundwater recharge/discharge. This process results in cool water discharge and cooler refugia habitat for aquatic organisms along the margins of streams.
- In the PLTA, the surface water temperatures are regulated by both riparian canopy closures and by shallow groundwater aquifer discharges in the form of seepage zones and riverine wetlands adjacent to streams. Many areas were identified where groundwater may have played a major role in regulating the summer water temperatures in the past. However, few of these shallow groundwater source areas were found to be fully functioning and represented an impaired condition.
 - Along perennial streams, a minimum Riparian Reserve buffer distance of 100 linear feet (horizontal) is necessary, consisting of a mature conifer overstory with 65% canopy cover, for protecting water temperatures. Riparian canopy closures which are effective at directly blocking short-wave radiation from reaching the water surface while the surrounding mature canopy also provides an indirect effect of buffering the ambient air temperatures within the Riparian Reserves.
 - Protection and restoration of small seeps, representing shallow groundwater features, and wetland from ground disturbance while providing adequate overstory thermal

protection to these micro-site features is critical to restoring and maintaining these temperatures. Restoring areas by eliminating roads and de-compacting soils restores water infiltration and recharge of shallow groundwater.

- There are High risk riparian commercial thin stands located along perennial streams which regulate water temperatures in fish-bearing streams. These streams include Lion Gulch, Cougar and Billy Goat Gulches. Commercial thinning and underburning reduces overstory canopy closures and may affect water temperatures. Stands include

Riparian Reserves

The interim Riparian Reserve buffer widths will apply to all management activities in this project. These distances are specified in the amended Northwest Forest Plan, Record of Decision, Standards and Guidelines, pages C30 and C31 (USDA, 1994). This does not imply that activities are prohibited within the reserves, only that the Aquatic Conservation Objectives and Standards and Guidelines apply within these buffer widths.

Environmental Consequences

Direct and Indirect Effects

Alternative 1 - No Action

Hydrology

If no actions are taken in regard to roads in Riparian Reserve, replenishment of large wood in streams and floodplains, or restoration of natural flowpaths, the watershed condition would remain impaired with respect to natural streamflow regimes. The current high density of roads in riparian areas would remain hydrologically connected to streams and wetlands, delivering concentrated snowmelt runoff and stormwater rapidly to streams. Road improvements and storm-proofing of roads would not occur. This would in turn result in:

- Aggravated erosion and destabilization of stream channels;
- Sustained higher magnitude peak flood events and downstream flooding. Climate change forecasts project more frequent and potentially larger rain events in winter. This is expected to further increase peak flood magnitudes from rain-on-snow events;
- Sustained loss of natural water storage associated with shallow groundwater recharge and wetland functions, resulting in lower baseflows in late summer.

Road culverts would remain undersized for the current volumes of water they need to pass (and even more inadequate under climate change forecasts). Plugged culverts would alter flowpaths, amplify flow velocities, and cause road damage that affects aquatic resources and public access.

FSR 9718000 would continue to divert surface flow through a small cross-section of the adjacent meadow, preventing recharge of a shallow groundwater aquifer and reducing its capacity to store water.

Motorized vehicles would continue to access undeveloped campsites along Lion Gulch and Cougar Gulch. Associated activities, including unauthorized OHV use are likely to expand, compacting more riparian soil. As a result, the floodplain's capability for growing and recruiting large trees and woody debris to streams would decline, which would in turn reduce or eliminate floodplain roughness that

Table 3.5. SUMMARY OF EXISTING CONDITIONS

Drainages (14 th field HUC)	Surf. Soil Erosion Haz.	Fine Sediment Delivery Haz.	Water Temp. Risks	Stream Channel Function	Stream- bank Stability	Floodplain Connectivity /grndwtr recharge	Peak Flow Base Flow
Lower Williams Creek	Moderate to High	High	High	Non-functioning	Unstable	Non-functioning	Non-functioning- mining, channel alterations, roads
Lower Lion Gulch	Moderate	High	High	Non-functioning	Unstable	Non-functioning	Non-functioning – roads/ditches, channel alteration, absence LWD, canopy cover.
Middle Lion	Moderate	Moderate	High to Low	Partially Functional	Moderately Stable	Non-functioning	Non-functioning - roads, LWD, channel. Alterations, canopy cover.
Upper Lion	Moderate	Moderate	Low	Partially Functional - recovering	Moderately Stable	Functional	Partially Functioning – road crossings, ditches
Cougar/Billy Goat	Moderate	High	High to Low	Non-functioning	Unstable	Non-functioning	Non-functioning roads/ channel alterations mining, canopy cover, absence LWD

helps dissipate flood energy. Snowmelt and stormwater runoff would not infiltrate compacted soils, increasing runoff and reducing water storage on floodplains.

In the absence of any vegetation treatments, some parts of the planning area which were naturally more open would remain overstocked. Trees take up water, and overstocking reduces the amount of water that would be available for base streamflows. Effects on base flow are difficult to predict, because of all the ways that hydrologic functions have been impaired here. Higher canopy closure (40-80%) on some of the most productive sites would provide a margin of protection against rapid snowmelt from open forest areas.

High intensity wildfire may affect a large portion of the planning area, and could increase the magnitude of peak flows. If a fire removed 25% of the existing mature forest cover across the planning area, peakflow may increase by more than 20% for a larger flood event. This increase, in conjunction with other disturbances and the impaired condition of the watershed would result in considerable stream erosion, road damage, and sediment delivery.

No temporary logging roads would be constructed in sensitive headwaters, however, the opportunity to relocate a severely rutted section FSR 9718112 to a more sustainable location via a timber sale contract would be foregone. This road would continue to intercept and channel stormwater and snowmelt runoff directly into Billy Goat Gulch.

Stream Channel Conditions

Because of altered hydrology, stream channel conditions would continue to change, with:

- continued vertical downcutting of low gradient stream reaches through riparian meadows and broader valley bottoms in Lion Gulch, Cougar Gulch, Billy Goat Gulch, and lower Williams Creek;
- increased lateral channel migration and soil erosion from the banks of other reaches, contributing to high fine sediment levels downstream;

A road's proximity to a stream increases the frequency of woody debris removal from within the stream and floodplain, due to human activities. Due to continued high road densities within Riparian Reserve, the level of woody debris recruitment would remain below natural levels, reducing flood energy dissipation and the water storage capacity of floodplains.

Because large wood replenishment and removal of legacy fill from old roads and railroad beds would not occur, some channels would remain artificially confined and entrenched, with accelerated streamflow velocity, streambank erosion, and in-channel erosion.

Sedimentation

Current high levels of sediment delivery from roads and 4WD trails would continue, and as road deteriorate over time, they would continue to pose a risk to water quality due to chronic and episodic annual erosion, and to catastrophic erosion from culvert blockages and mass wasting of road prisms. In 2009, a mass wasting event on FSR 9712113 resulted in emergency closure of that road.

Severe erosion due to lack of road drainage would affect both open and closed roads (for example, FSR 9712000 at milepost (MP) 0.65, and FSR 9712210). Poorly located roads and trails would continue to deliver sediment to streams, including FSR 9718112 and 4WD 339. Roads with undersized culverts would continue to concentrate flows, causing erosion to streambanks or hillslopes below. This effect would become more severe under climate change scenarios.

By not implementing large wood replenishment, the erosion within channel would continue and the ability to trap and restore sediment would not be restored.

Water Temperature

Water temperatures would remain impaired due to absence of mature canopy cover along streams and floodplains—a consequence of previous harvest and mining activities. In the absence of disturbance some areas would slowly recover to a dense forest condition that provides shade, however, temperature impairments would persist in areas where roads, active mining, and dispersed campsites occupy streambanks. Restoration actions designed to restore shallow groundwater recharge and delivery of cool water to streams to restore water temperature would not occur.

Alternative 2 (Revised Proposed Action)

Hydrology

Watershed condition would improve with the following:

Riparian, Stream Channel, and Aquatic Habitat Restoration Actions:

- Five acres of severely compacted soil within floodplains and Riparian Reserve would be restored at 4 modified campsites, increasing soil-water infiltration rate and recharge of shallow groundwater in floodplains, and reducing rapid runoff to streams;
- 226 acres of Riparian Reserve associated with perennial fish-bearing streams and headwater intermittent channels would be restored through riparian large wood replenishment. Adding wood would slow runoff to streams, reduce peakflow discharges, and reconnect streams with their natural floodplains (promoting overbank flow and recharge shallow groundwater aquifers and wetland hydrology).
- Proposed road improvements for FSR 9718000 and FSR 9718112 (both north and south ends) would restore over one acre of floodplain and wet meadow.
- Removal of legacy fill (on 0.5 mile of abandoned road and railroad beds) would restore overbank flow and natural channel migration and sinuosity;
- Replenishment of large wood in over 8.5 miles of stream would improve floodplain roughness and promote

Road and 4WD treatments and Improvements would achieve the following:

- 12.3 miles of hydrologically connected road would be decommissioned (including temporary roads constructed for timber haul and roads not associated with logging). As a result, riparian road densities across all HUC14s (subdrainages in the planning area would decline by 42%, from an average 9 mi/sq. mi. to approximately 5 mi/sq. mi. (a level still considered high, but a vast improvement over the current condition). Over 178 acres of roadbed would be rehabbed, slowing runoff and restoring shallow groundwater.
- 0.9 miles of road (16 ac or roadbed) would be restored through establishment of more effective road closures on roads already managed as closed to motorized use. Effects include long-term improvements in increased infiltration and reduced storm and snowmelt runoff.

- FSR 9712112 and 4W 339 trail relocation would restore hillslope and floodplain hydrology in the Hill-climb Restoration Area, middle Lion Gulch, and Billy Goat Gulch. This would retain snowmelt/stormwater for improved summer flow and also reduce flood flows.
- Redesign of stream crossings to ensure that culverts are sized to pass a 100-year flood flow (FSRs 9712000, 9718000, 9705000, and their arterial ML2 road segments).
- The wet meadow crossed by FSR 9718000 would be restored by installing permeable road fill that allows water to flow beneath the road surface to inundate a much larger cross-section of meadow and recharge shallow groundwater.
- Road storm-proofing and drainage improvements on roads in Riparian Reserves by adding ditch relief culverts, surface drainage and permeable segments of road fill will restore both surface and shallow groundwater flow regimes. Examples included FSR 9712000, 9712112, 9712115, 9718000, 9718118, and 9705000).

Commercial thinning is the only vegetation treatment with potential to effect changes to hydrology in the Williams Creek drainage. This potential effect would occur through a reduction in closed canopy cover and soil compaction associated with landing locations and skidding/yarding. Because of impaired watershed conditions, commercial thinning in Riparian Reserves was limited in extent through the use of variable width riparian buffers needed to ensure retention of shade, provide for large woody debris recruitment, and protect riparian soil conditions. Prescribed buffers were applied to both perennial and ephemeral/intermittent streams. Outside of the prescribed buffers but still within Riparian Reserves, riparian thinning prescriptions were designed to meet ACS objectives or snowpack accumulation/retention and improved long-term recruitment of large trees that would support channel and floodplain functions when they fall.

With buffers and riparian prescriptions, there would be no direct effects from thinning to hydrology within Riparian Reserves. Only 1.5% of Riparian Reserve acreage to be thinned (4.3 out of 274 acres) is planned for ground-based logging. There is potential, however, for indirect effects to riparian areas from thinning of adjacent upland areas, particularly those stands that encompass a high proportion of Riparian Reserve or border a large amount of Reserve.

Riparian Reserves, non-forested swales, and moist to wet meadows would not be utilized for landings, to prevent detrimental soil compaction and accelerated runoff.

Perennial Stream Riparian Reserves where buffer widths were applied are as follows:

Middle Lion HUC = Stands 343C (Unit 57), 343G (Unit 59), 343B (Unit 56),

Upper Lion HUC = Stand 113L (Unit 32),

Cougar Billy Goat Gulch = Stand 113/149 (Unit12), 670C (Unit XX), 149 (Unit 11), 215B (Unit 1), 215C (Unit7), 157A (Unit 8), 151 (Unit 10 -east)

Lion Gulch Mainstem = Stand 319 (Unit 48), 154 (Unit47), 1 (Unit46), 155 (Unit 45), 291 (Unit 66)

Lower Williams = Stand 164 (Unit 2), 158 (Unit 3)

Intermittent/Ephemeral Stream Riparian Reserves buffer widths on stands are too extensive to list. Applying the buffer distances as prescribed in Appendix A will provide sufficient protection from hydrologic effects.

Six subdrainages (HUC14s) would be affected by commercial harvest. In three with extensive past harvest (Table 3.6), proposed commercial thinning under Alternative 2 would encompass more than 25% of the drainage area, raising concerns for increasing water yields and runoff, and downslope effects on roads and stream channels. The greatest concern is for areas where the proposed thinning acreage encompasses productive sites (a select group of stands identified in the field, based on available soil water capacity (AWC) and topographic position within stands. In these areas, AWC is generally in excess of vegetation demands).

Table 3.6. Extent of past harvest and proposed commercial thinning, in 3 subdrainages where combined effects would exceed 25% of the drainage area.

HUC	% of HUC Affected by Past Commercial Harvest (last 30 yrs)	Alt 2 Revised Proposed Commercial Thinning		Total Drainage Area Affected (past and proposed)	Alt 2 Revised - Acres of Productive Sites Proposed for Thinning	Alt 2 Revised - Productive Sites as % of Total Acres to be Commercially Treated in HUC
		(ac)	% of HUC			
Lower Lion	19.3 %	401	25.4%	44.7 %	111.4	27.8 %
Middle Lion	20.3 %	309	26.0	46.3 %	18.2	6.0 %
Cougar Billy Goat	15.3 %	454	27.8 %	43.1 %	129.1	28.4 %

To recognize the limitation in modeling peakflows in this landscape and in order to mitigate the effect of the extent of disturbance, we examined the natural distribution of mature forest canopy closures across this landscape. The Swauk Pine planning area is made up of a mosaic of both naturally occurring open areas as well as dense patches of closed canopies. Over 30 % of the drainage area is naturally open and incapable of supporting a dense closed canopy stand. However, not all of those dense canopy patches identified for commercially thinning were uniformly and historically open canopies. Ann Camp, in her research on “Predicting Late-Successional Fire Refugia from Physiography and Topography” (Camp 1995) found that “probabilities of late-successional refugia occurrences increase with variable combinations that correspond to high soil moisture levels.” Furthermore, she concluded that “The pre-settlement landscape of the Swauk Habitat Conservation Area (HCA) did not contain vast expanses of old, late-successional forest. Rather, late-successional and old-growth forest existed primarily as small (10 ha or less) patches (2.5 acres) associated with specific physiographic and topographic settings. Larger late-successional and old growth stands (rarely >40 ha) (10 acres) were most often on north facing headwalls or within valley bottoms especially at the confluences of perennial streams.” This is important as it points to a distribution of 2.5 to 10 acre patches of mature dense canopy closures which are highly dependent on available soil moisture, aspect and topographic position.

Mimicking this pattern in terms of patch size retention, number of trees retained per acre and canopy closures is a way to minimize the effects of forest thinning on changes in water yield and hydrology.

Appendix B provided such a strategy. On productive sites (See Hydrology Specialist Report), marking would also be modified to retain as many as 50 trees per acre, or approximately 55 % canopy cover. These areas represented nearly 260 acres of the 1327 total acres proposed for commercial thinning. By modifying the marking within 20% of the total acres, to recognize the importance of these areas hydrologically, it is believed that the natural flow regime would be restored and potential changes to peakflow would be mitigated.

Effects from Roads

The project would entail construction of 7.4 miles of *new temporary* road (0.5 miles in Riparian), and reconstruction of 1.3 miles of *unauthorized* road (0.1 miles in Riparian) and 3.6 miles of *closed* roads (1.0 miles in Riparian) (Table 3.7). All segments in Riparian Reserve potentially affect hydrology. While most of the crossings identified below are headwater, small intermittent streams or swales, these have been recognized in research literature for their importance in hydrology and sediment routing. An effect on hydrology occurs when the road surface or ditchline intercepts snowmelt runoff, stormwater or shallow groundwater and conveys that water to a stream channel crossing and discharges it into the stream or swale. Rutting on the road during use can also contribute to this effect. To minimize this effect each temporary road has been evaluated relative to the risks. Nine proposed temporary roads totaling 2.67 miles would require implementation of BMPs to reduce potential effects to hydrology (Table 3.8).

Table 3.7. Summary of proposed road construction or reconstruction for timber haul.

	All Roads				Roads in Riparian Reserve			
			Sys Trl or Closed Rds					
HUC 14	New	Unauth Rds		Total	New	Unauth. Rds	Closed Rds	Total
Lower Lion	1.39	0.16	1.13	2.68	0.10	0	0.57	0.67
Middle Lion	2.65	0.00	0.23	2.88	0.22	0.00	0	0.22
Upper Lion	0	0.18	0.22	0.4	-	0	0.05	0.05
Cougar / Billy Goat incl. relocate of 9718- 112	1.69 0.39	0.43	1.65	4.16	0.15	0.14	0.11	0.40
Lower Williams	0.47	0.19	0.32	0.98	-	0	0.18	0.18
Upper Williams	0.13	0	0.26	0.39	0.02	0	0.10	0.12
Subtotals	6.72	0.96	3.81	11.49	0.49	0.14	1.01	1.64
Outside HUC14 9700- 161 temp rd	0.36	-	-	0.36	0.04	-	-	0.04
9705 ridgeline	0.32	0.37	-	0.69	-	-	-	-
Totals	7.4	1.33	3.81	12.54	0.53	0.14	1.01	1.69

For new temporary roads, the Forest Road Policy (Okanogan-Wenatchee National Forest 2013) characterizes temporary roads in two categories; those which are determined to not affect sensitive areas, and those which are proposed to be constructed in a sensitive area. The distinction between the 2 is determined by an evaluation of the road by an engineer and resource specialist considering 9 elements in that evaluation. If one or more of the elements applies, then the road will be reviewed by both parties and Engineering shall provide plans or criteria for use in construction using contract clause CT5.1# (option1). In either case, the effects of temporary roads are short-term in duration as the temporary road will be decommissioned by the purchaser following completion of log hauling and other contractual requirements.

Table 3.8. Summary of temporary road construction for haul routes in sensitive areas, and required BMP.

Road Labels	Road Length (miles)	Applicable Elements for CT 5.1# (Option1) Consideration	Description / Issues /BMPs
T01	0.13	Stream crossing, slope stability issues below road	Surface drainage BMPs required, risk of channeling runoff to swale above unstable landform
T30	0.30	Stream crossing at origin, 50% sideslope, slope stability	Streamflow capture on beginning of road, move origin away from existing stream crossing on 9700-161. Unauthorized 4WD use risk.
T53	0.25	Intermittent stream crossing	headwaters, needs road surface drainage, outslope.
T55	0.40	2 stream small intermittent stream crossings	Flatten grades going in and out of crossing to prevent draining long segments into crossings. Shallow groundwater and clay soils. Unauthorized 4WD use risks.
T55.1	0.24	Steep sideslope, 45-55%	Portions are full bench road construction
T60	0.35	Stream crossings	24 inch culvert required at small tributary, avoid draining road surface into crossing. Unauthorized 4WD trail use adjacent to origin, high risk.
T65	0.50	Intermittent stream crossing	Crosses swale at headwaters avoid draining road surface into swales and onto eroding unauthorized 4WD hill--climbs below road.
T74	0.40	Moist meadow, groundwater seeps	Ridgetop road needs location to avoid impacting groundwater feature. Unauthorized 4WD risks.
UA	0.10	Intermittent stream crossing at end	Landing location issue as road terminates in Riparian Reserve. Avoid delivery of surface runoff into headwater swale.

In addition to the temporary roads, there are two system roads that would be used for log haul which currently are contributing to impaired hydrology at the site-scale. One is FSR 9705205. See Appendix E for design criteria. Log hauling poses no additional effects to hydrology, other than what has been discussed above for roads.

Effects from Planned Underburns

For fuel reduction actions, the loss of mature conifers during underburning would further reduce the mature vegetative cover over what is planned in the commercial thinning operations due to localized torching. It is assumed, based on observations of other overstory tree losses during underburning operations in other areas of the Swauk that an additional 5 percent of the mature forest overstory may be lost. This is based on estimates from the project fuels specialists (Starkovich 2014) on the potential losses which may be expected following operations. These need to be minimized through tactical adjustments in operations. These levels of canopy loss, on top of the commercial thinning, may contribute to additional short-term indirect and cumulative effects of increased runoff and peakflow discharges in two HUC14; Lower Lion Gulch and Cougar/Billy Goat Gulch.

Stream Channels

Stream channels and their conditions are inextricably linked to the hydrology of the watershed. The objectives for nearly all of the restoration actions are tied in some way to restoring the functions of hydrologic features and their natural flow paths; restoring impaired storage, routing and delivery of water to streams to reduce the effects on stream channel conditions and downstream flooding. The indirect effects of the actions found under the categories of *Riparian Restoration*, *Stream Channel/Aquatic Habitat Restoration*, and *Road/4WD Trail Treatments* are the long-term restoration of impaired conditions and functions of streams (see Summary -Existing Condition table). This include fully function floodplain connections, restored channel form, stream channel stability and restoration of the erosion and sediment regime from within the channel.

Commercial thinning prescriptions and the associated logging activities are not anticipated to contribute directly, indirectly or cumulatively to effects on the stream channels. The establishment of Riparian Reserve buffers, during unit boundary layout; identified on the Sale Area Map for contracting and administrated on the ground is expected to prevent any direct or indirect effects to stream channel stability or function. As discussed in the Hydrology section, the silvicultural prescriptions have been modified to retain areas of dense canopy cover to mitigate increases in water yield from *contributing source areas* following logging. Minimizing post-harvest water yields will provide a margin of protection to stream channel which are currently unstable and eroding under the current hydrology regime.

Sedimentation

Road and unauthorized 4WD trail decommissioning and road improvements together will contribute to significantly reducing sediment delivery to streams and wetlands. This is due to reductions in chronic annual inputs of sediment from surface erosion as well as reducing the risks of mass wasting of sections of roads and trails. The reduction in the miles of road which are hydrologically connected via floodplains and stream crossings, and the disconnection of road ditch drainage to stream networks through the addition of ditch relief culverts will reduce sediment delivery at the site scale by an average of 1/8 ton of sediment per site annually. Road decommissioning projects identified include restoring the natural flow regime at over 50 stream crossing sites across the PLTA; removing undersized culverts reconstructing the channel and stabilizing soil with native vegetation. This would result in reducing sediment delivery to streams by over

6 tons per year. Not all roads are equivalent in their contributions. Appendix D identifies and prioritizes those roads, both system and unauthorized, as well as unauthorized 4WD trails which represent the greatest risks to sedimentation.

Restoration of hydrology and stream channel conditions would begin to stabilize severely eroding streambeds and banks. Large woody debris replenishment will sort and trap sediment which will build streambed elevations and restore floodplain connections and floodplain vegetation and roughness; actions which will further restore the rates of in-channel erosion and sediment regimes in downstream reaches.

Implementation of restoration actions would cause short term disturbances to vegetation and soils. These may include creation of localized areas of bare soil during soil decompaction or movement of heavy equipment in and out of the site. A number of erosion control measures will be employed to insure that the implementation does not aggravate erosion or compaction of riparian soils.

Commercial logging and temporary road construction may contribute sediment to headwater intermittent stream channels, both during construction and post-logging decommissioning. These amounts are expected to be relatively small given the limited miles of new construction in Riparian Reserves. Sediment would be expected to be transported downstream where it would be distributed and stored in very small amounts within the channel. BMPs identified in the Hydrology section would be effective at minimizing this risk.

Fuel reduction with underburning is expected to retain the required 30 % of the organic soil horizon post-burn and be conducted under conditions which allow for protection of soil infiltration properties and coarse woody debris retention. This maintains the site's productivity and plant communities which prevent soil erosion.

Water Temperatures

Restoration actions found under the categories of *Riparian Restoration*, *Stream Channel/Aquatic Habitat Restoration*, and *Road/4WD Trail Treatments* have been developed for the long-term restoration of impaired water temperature conditions (see Summary -Existing Condition table). The actions which restore connections between surface runoff and shallow groundwater hydrology will help achieve this objective in the Williams Creek drainage. Water temperatures will benefit from the cumulative effects of a multitude of actions such as reducing soil compaction and restoring infiltration rates in Riparian Reserves, identifying and protecting groundwater features, slowing the movement of water within streams and restoring overbank flood frequencies for groundwater recharge. Restoration actions specifically targeted at restoring disturbances to hydrologic features and their natural flow paths will be successful at restoring shallow groundwater recharge and will result in an improved network of cool groundwater inputs into streams.

Commercial thinning and logging will not contribute to any direct or indirect effects on water temperatures.

Finding of Consistency with Aquatic conservation Strategy Objectives

Objective 1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

Alternative 1: The current distribution, diversity and complexity of watershed and landscape scale features would not be maintained. Does retard or prevent the attainment of this objective.

Alternative 2: Restoration actions would restore complexity and landscape scale features. Aquatic restoration actions would improve floodplain connectivity to stream channels and improve natural

flow paths for water, thus improving riparian and aquatic habitat diversity and complexity in the project area. Thinning would maintain and help increase diversity and complexity by encouraging the growth of larger trees. The protection of the aquatic system would be ensured through the implementation of riparian harvest prescriptions. Alternative does not retard or prevent the attainment of this objective.

Objective 2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections including floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. The network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian dependent species.

Alternative 1: The current degraded condition of connectivity would be maintained. Does retard or prevent the attainment of this objective.

Alternative 2: Restoration actions would restore connectivity by improving natural flow paths for water, increasing in channel complexity, and improving over 400 acres of riparian habitat in the project area. Instream connectivity would be improved by upgrading 8 existing culverts to pass aquatic organisms, improving eight miles of instream habitat. Restored surface water and ground water connections would also contribute to improved instream habitat conditions for fish populations in the Upper Swauk subwatershed. Riparian Reserves would be maintained through the implementation of Riparian Reserve buffers, harvest prescriptions and Heavy Retention Marking Prescriptions for Contributing Source Areas. Does not retard or prevent the attainment of this objective.

Objective 3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks and bottom configurations.

Alternative 1: The current degraded condition of physical integrity would be maintained. Does retard or prevent the attainment of this objective.

Alternative 2: Restoration actions would restore the physical integrity. Road treatments (decommissioning, drainage improvement, culvert upgrades/removals) would improve streambanks and bottom configurations at crossing sites. Large wood replenishment would halt the downcutting of stream channels and improve bank stability in Lion and Cougar Gulches.

Riparian Reserves adjacent to fish-bearing streams and nonfish-bearing perennial streams would be maintained with the implementation of Riparian Reserve harvest prescriptions. Heavy Retention Marking Prescriptions for Contributing Source Areas will restore flow regimes. Best management practices would be implemented on intermittent stream crossings on new temporary roads and unauthorized roads. Does not retard or prevent the attainment of this objective.

Objective 4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

Alternative 1: The current degraded conditions for water quality would be maintained. Taking no action would retard or prevent the attainment of this objective.

Alternative 2: Implementation of Restoration Actions, Riparian Reserve buffers and harvest prescriptions, and Best Management Practices would maintain water quality. Aquatic restoration actions would improve water quality by restoring connections between streams/wetlands, floodplains, and natural flow paths to improve surface and ground water exchange for instream temperature regulation. They would also reduce chronic sediment inputs to stream channels from stream crossings. There may be short-term impacts to water quality (increased sedimentation) during project implementation; however, project design criteria were developed to minimize these impacts and keep them to an acceptable level. Alternative 2 would not retard or prevent attainment of this objective.

Objective 5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

Alternative 1: The current degraded condition of the sediment regime would be maintained. Taking no action would retard or prevent the attainment of this objective.

Alternative 2: Implementation of Restoration Actions, Riparian Reserve buffers and harvest prescriptions, Heavy Retention Marking Prescriptions for Contributing Source Areas, and Best Management Practices will restore the natural sediment regime. A total of 101 road/stream crossings would be eliminated through proposed road treatments and aquatic restoration actions. Removing these obstructions or pinch points where sediment transport is impeded or generated would reduce chronic fine sediment inputs to streams and begin to move this objective towards restoration. Alternative 2 would not retard or prevent the attainment of this objective.

ACS Objective 6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high and low flows must be protected.

Alternative 1: The current degraded condition of in-stream flows would be maintained. Taking no action would retard or prevent the attainment of this objective.

Alternatives 2: Implementation of restoration actions, Riparian Reserve buffers and riparian harvest prescriptions, Heavy Retention Marking Prescriptions for Contributing Source Areas, and Best Management Practices will maintain and restore the natural in-stream flow regime. Reducing the stream drainage network, and improving floodplain connectivity and channel stability would restore natural flowpaths in the project area that are efficient at routing sediment and nutrients and would regulate base and peak flows in the project area. Alternative 2 would not retard or prevent the attainment of this objective.

ACS Objective 7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

Alternative 1: The current degraded conditions of floodplain inundation and water table elevation would be maintained. Does retard or prevent the attainment of this objective.

Alternatives 2: Restoration actions will restore the timing, duration and inundation of floodplains and water tables. Implementation of Riparian Reserve buffers, harvest prescriptions, Heavy Retention Marking Prescriptions for Contributing Source Areas, and Best Management Practices

will restore the existing regime of floodplain inundation and water table elevation. Does not retard or prevent attainment of this objective.

ACS Objective 8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

Alternative 1: The current degraded condition of species composition and structural diversity would be maintained. Taking no action would retard or prevent the attainment of this objective.

Alternative 2: Implementation of restoration actions (large wood replenishment, campsite modifications), Riparian Reserve buffers and harvest prescriptions, Heavy Retention Marking Prescriptions for Contributing Source Areas, and Best Management Practices will restore the current species composition and structural diversity of plant communities in riparian areas. Areas impacted by the implementation of this project will be scarified, seeded, and planted to provide ground cover and increase infiltration rates in soil to reduce erosion. Alternative 2 would not retard or prevent attainment of this objective.

ACS Objective 9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate riparian-dependent species.

Alternative 1: The degraded condition of riparian habitat (due to scarcity of large trees and logs and loss of riparian vegetation to roads, mining, and campsites) would persist. Taking no action would retard or prevent attainment of this objective.

Alternative 2: Prescribed no treatment areas in Riparian Reserves would maintain existing habitat for riparian dependent species. Road decommissioning in Riparian Reserves and dispersed campsite modification would improve vegetation, streamflow, and erosion patterns that benefit terrestrial and aquatic plant and animal populations in the project area.

See Wildlife section of Chapter 3, for additional findings.

Forest Vegetation, Fuels, and Fire Risk

Introduction

Based on issues raised during scoping, the focus of the analyses for forest vegetation, fuels, and fire is on development of late successional habitat characteristics (including large trees), forest susceptibility to disturbance (insect and disease outbreaks and wildfire), culturing larger patches of late successional habitat, and vegetation treatments within Riparian Reserves.

Regulatory Framework

- Under the Northwest Forest Plan, all silvicultural treatments in Late Successional Reserve (LSR) must be beneficial to the creation or maintenance of late successional habitat (1994 ROD page x). Thinning to encourage tree growth while simultaneously reducing risk of catastrophic disturbance is encouraged (1994 ROD, C-13).

- All silvicultural treatments in LSR must be reviewed and approved by the Regional Ecosystem Office (REO), unless that office has specifically exempted it based on a prior review. The Wenatchee Late Successional Reserve and Managed Late Successional Area Assessment (LSRA) (U.S. Forest Service 1997) has been reviewed and approved by REO, and now provides guidance for all actions in LSR on the Wenatchee National Forest. Actions that are consistent with the LSRA require no additional review by REO.
- Treatments must be based on site-specific silvicultural examination and prescriptions prepared or approved by a certified Silviculturist. Prescriptions must protect critical resources and address all management objectives (such as streamside protection or wildlife needs). They must also address existing insect, disease, or fuel conditions in treatment areas, and consider integrated pest management (the list of pests includes insects, diseases, animals, and competing vegetation). Utilization will be emphasized as the primary means of disposal for waste wood material (1990 Forest Plan pages IV-92 to IV-93).
- Forest policy requires use of the Okanogan-Wenatchee National Forest Restoration Strategy (USDA Forest Service 2012) to plan landscape level restoration projects such as Swauk Pine. The Restoration Strategy is incorporated by reference.
- The Omnibus Public Land Management Act of 2009 has bearing on this Project. The Swauk Pine Restoration Project is located in a nationally designated priority landscape for restoration (Tapash). The Act encourages “use of forest restoration byproducts that can offset treatment costs while benefitting local rural economies and improving forest health”. For more information, see the Silviculture Specialist Report.

Methods and Scale of Analysis

Vegetative conditions in all treatment areas were assessed using aerial photography (2013). A full stand exam was completed for many proposed treatment stands in 2012 and 2013. The east-side variant of the Forest Vegetation Simulator (FVS) and project stand exam data were used to model effects of Alternative 2. Effects were analyzed for the short (0-5-year) and long (5-80-year)-terms, at the project scale.

Existing Conditions

Late Successional Habitat Structure

Dense late successional habitat is characterized by large tree structure, multi-layered canopy, snags, and downed wood. The greatest threat to dense old forest in the east Cascades of Washington is stand replacement fire (Everett et al. 1999). The historic fire return interval in Swauk LSR is 7-9 years. Because of fire suppression, multiple fire return intervals have been missed on this landscape, creating an overly high percentage of one particular forest structure class: dense young forest multi-story (YFMS)

YFMS here is over stocked and in a stage of self-thinning. Current tree densities are not sustainable for the sites they occupy. All growing space is fully occupied (Cochran et al. 1994). Tree growth in many stands is less than 0.5 inch per decade, indicating low tree vigor (stand exam data 2012). Widespread tree mortality is occurring within the planning area.

In places, deep fuel beds have developed, creating a hazardous fuel condition that raises the risk of high intensity stand replacement fire. High intensity fires after long periods of fire exclusion can create early seral forest or brush fields, as seen in Iron Creek (a nearby drainage). Iron Creek burned with high intensity in the 1940s and is now only partially stocked with conifers and lacks closed canopy forest structure.

The Table Mountain Wildfire of 2012 illustrated the flammable character of the YFMS structure type (Fig. 22). Fire severity was mixed, but 5 YFMS stands in the project area burned with high severity. Many trees over 20 inches dbh were killed on these sites.

A threshold for crown mass needed to carry a crown fire is generally 30-40% crown closure, with crown bulk densities of $>0.10 \text{ Kg/M}^3$ (Keys and O'Hara 2002). All YFMS structure in the project area is above this threshold and at risk to running crown fire (FVS-FFE).

The arrangement and connected nature of dense forest patches with moderate and high crown fire risk are putting the landscape at risk for large scale loss of late successional habitat (Table x).

Large Tree Structure

The 2012 Okanogan-Wenatchee Forest Restoration strategy recommends a target of 18 large trees (>25 inches dbh) per acre in both Old Forest Single Story and Old Forest Multi-story structure classes (Hessburg et al. 1999). Stand exams indicate that that none of the proposed treatment areas currently have 18 trees per acre >25 " diameter.

Rate of growth is dependent on forest stocking (Long 1998). In YFMS, tree densities must be reduced to create growing space for rapid growth into larger size classes. Mechanical tree thinning is the most efficient and effective way to thin and create large tree structure.

Fig. 22.

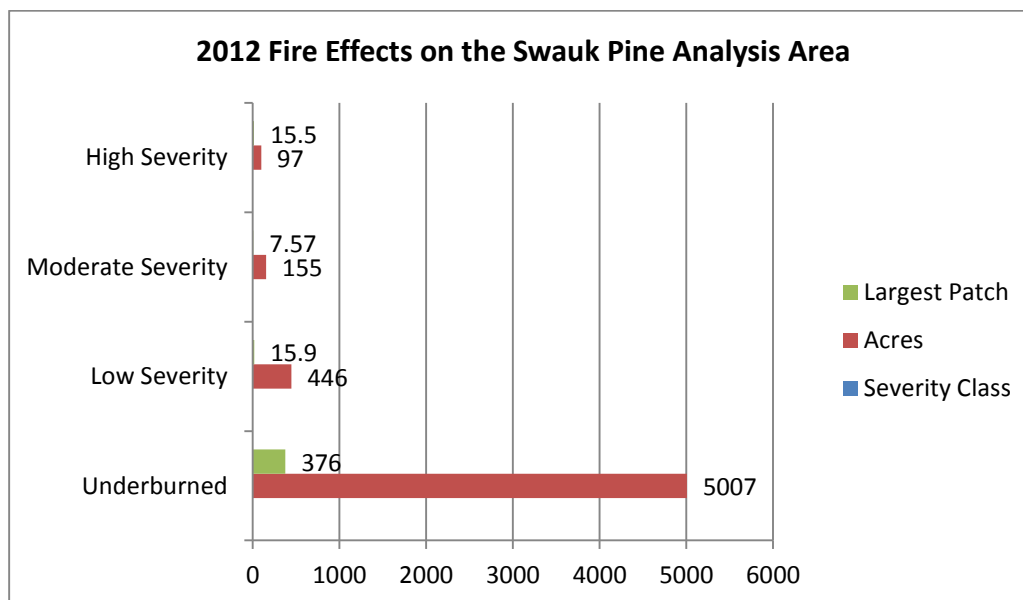


Table 3.7. Running crown fire potential, by current and historic patch density and mean patch size. All units are in acres.

Running Crown Fire Class	Current Patch Density (#Patches/ 100 ha.)	Historic Patch Density (#Patches/ 100 ha.)	Current Mean Patch Size	Historic Mean Patch Size
Low	49.77	130.96	708.34	196.26
Moderate	158.32	74.13	55.33	118.48
High	144.72	61.7	117.48	0

Maintenance of Natural Insects and Disease Patterns

Currently, there is an active spruce budworm and linked bark beetle outbreak throughout the project area. Stand exams in 2012 show that 27 out of 28 stands examined had moderate or severe spruce budworm defoliation (Swauk Pine Common Stand Exam Report 6). Top kills ranged from 35% to over 80%. Aerial detection for budworm in 2014 showed that 30% of the area became affected within the last two years. Spruce budworm habitat is overly abundant and spatially connected, creating high risk of spread.

Tree growth is negatively affected by budworm defoliation. Diameter growth declines with loss of crown. Bark beetles populations typically follow defoliators because affected trees are stressed, release attractant pheromones, and provide an abundant food source. (Goheen et al. 2006)

Mistletoe is a parasitic plant found in many stands in the Swauk Pine analysis area. It can be lethal in Douglas-fir. The infections causes platform branches which creates habitat for arboreal rodents and nesting structure for birds. Retaining non-epidemic levels of mistletoe in treatment areas is an LSH objective for wildlife habitat.

Table 3.8. Spruce budworm habitat – Current Condition.

Spruce Budworm Habitat	Current Patch Density (#Patches/ 100 ha.)	HRV Patch Density (#Patches/ 100 ha.)	Current Mean Patch Size (ac.)	HRV Mean Patch Size
Low	135.70	96.37	91.55	89.46
Moderate	158.32	118.61	112.33	44.97
High	117.62	44.78	261.88	263.69

Landscape Departures

Past management activities and exclusion of fire have fragmented and changed cover types in the Swauk Pine analysis area. Table 3.10 (next section) displays current levels of departures for key stand-related metrics. An in depth analysis of landscape departures is located in the Silviculture specialist report.

Treatments in Riparian Forest

Currently most riparian forest in the project area is dominated by high density small diameter trees. Large wood sources and long term forest cover are needed for restoration of aquatic habitat. Lion Gulch,

Cougar Gulch, Billie Goat Gulch and Williams Creek are all deficit in large woody debris (Stream Surveys 2006). Aquatic Conservation Strategy Objective No. 8 calls for silvicultural treatments to enhance large wood structure in riparian reserves (1994 ROD page B-11).

Two situations exist in Swauk pine riparian reserves. First, thinning is proposed in 30 year old plantations within reserves. In the second situation, thinning in the younger cohort of young forest multi-storied (YFMS) stands is proposed.

In the plantation example, hand thinning, piling, and burning outside of a one tree height buffer (30') is proposed with the objective of accelerating growth of saplings and pole size trees, to become future large wood sources > 25" DBH.

Commercial thinning is planned outside of 75-110' no thin buffers, for 275 acres of YFMS. The analysis will evaluate how well the alternatives protect key riparian features in the event of a fire burning in reserves under 90th percentile weather conditions. Steady temporal recruitment of wood in riparian reserves is more desirable over time, than instantaneous, large pulses of wood from a stand replacement wildfire; followed by centuries of degraded riparian wood sources.

Environmental Consequences

Direct and Indirect Effects

Alternative 1 - No Action

Recruitment of Large Trees

Natural disturbances (wildfire, root disease, blowdown, and bark beetle outbreaks) would create growing space for recruitment of large trees. Since these agents are random in time and space, thinning and growth of the forest would also be random.

If a severe wildfire occurs, FVS modeling indicates that many dominant and co-dominant trees would be killed, resulting in much lower recruitment of large trees >25 inches dbh in 50 years (1.8 and 0.8 trees per acre respectively, for the ponderosa pine and mixed conifer types) (Figs. 23 and 24). Therefore, if no action is taken, recruitment of large trees would be highly variable, and dependent on natural events.

Post 90th Percentile Fire Effects on Crown Closure

Many stands would remain at high risk to crown fire. In ponderosa pine forest under 90th percentile weather conditions, any fires burning in winds over 24 miles per hour would initiate and carry crown fire. In the mixed conifer forest type, the wind speed threshold for crown fire would be 14 miles per hour. Expected crown closures following severe wildfire in ponderosa pine and mixed conifer forest types would be 13% and 11%, respectively.

There is potential for severely burned areas to reburn after large numbers of fire-killed trees fall and create a fueled. Reburns are common in east Cascade forests. Dead and downed fuel lengthens the residence time (duration of burning) for subsequent fires. Re-burns can prolong the time required to develop large tree structure by killing residual dominant and codominant trees (Morrison et al. 1990).

Re-burn events after wildfire may leave the forest in a stand initiation structure class that could take over 200 years to grow into an old forest single story or old forest multi-story structure.

Fig. 23. Retention and ingrowth of trees >25" dbh in the ponderosa pine cover type, after a 90th percentile fall fire event. Effects are modeled for current stand conditions (Alternative 1), and heavily thinned stands (30-40% canopy closure after thinning and underburning).

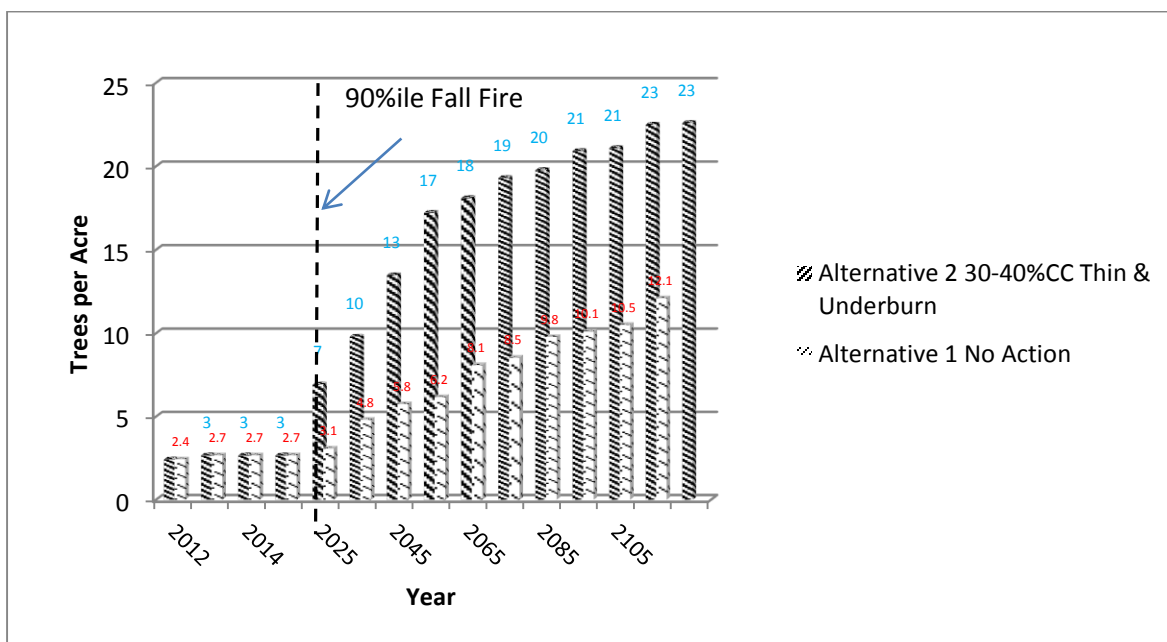
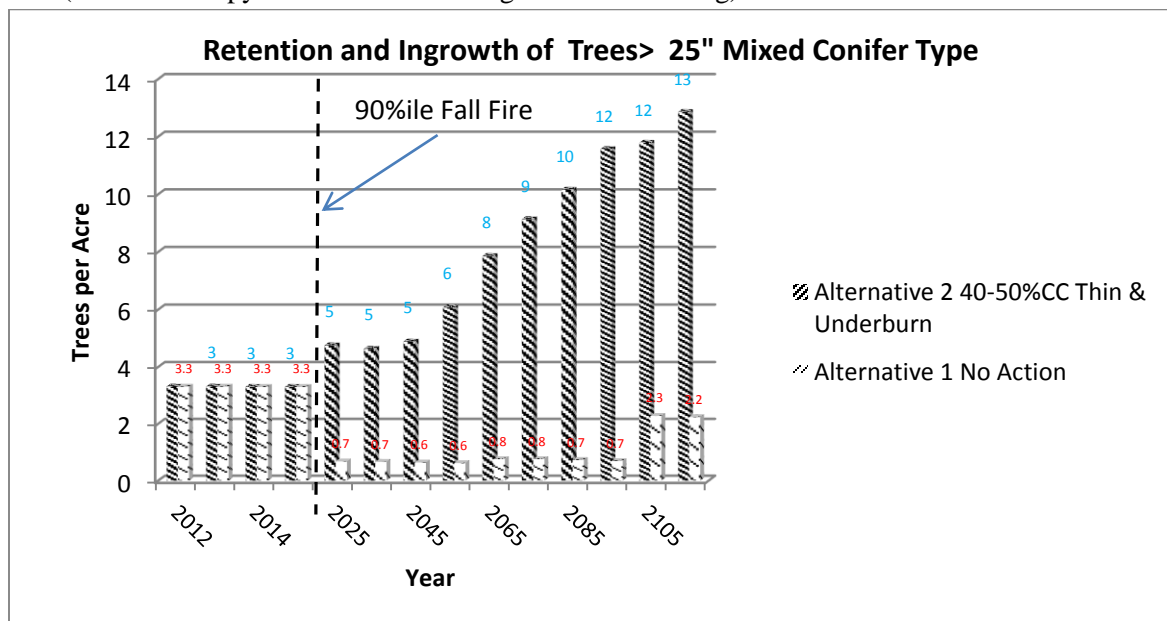


Fig. 24. Retention and ingrowth of trees >25" dbh in the mixed conifer cover type, after a 90th percentile fall fire event. Effects are modeled for current stand conditions (Alternative 1), and moderately thinned stands (40-50% canopy closure after thinning and underburning).



Culture of Late Successional Habitat

Stands would grow dense. Tree mortality associated with suppression and outbreaks of disease and insects may create some growing space for medium-sized trees to develop into the large size class. The pathway to old forest structure with large trees, however, is uncertain because defoliation, bark beetles, and wildfire intensity is uncertain. Insects, disease and fire may remove some or all of the developing forest structure at any point in time.

Currently, 2 large potential patches of late successional habitat exist in the planning area. One is on a north-facing slope in middle Lion Gulch. A second patch is north and east of Liberty Mountain (stand# s 41, 42, 44, 55, 56, 109, 110) on a landform with moist and wet soil characteristics. Both patches were fragmented by clearcutting in the 1970s and 1980s, and were inappropriately reforested with ponderosa pine. If no action is taken, fragmentation and unnatural dominance of ponderosa pine would persist on these sites, even as they grow dense. Both patches would become increasingly at risk to stand replacement fire.

Insect and Disease Patterns

Spruce budworm would continue to pulse and ebb across the planning area, creating stressed trees. Bark beetle outbreaks may follow. Beetle-killed snags could provide downed wood and better prey base habitat for spotted owls, but if beetle kill is widespread it would lead to development of deep fuel beds that support stand replacement fires. Alternative 1 has a low probability of maintaining natural levels of forest diseases and insects because of the extensive and connected nature of habitat (current condition table).

Trees are generally growing at less than 1" per decade (a slow rate that is favorable for fir engraver beetle, mountain pine beetle, and western pine beetle (Hall, 1989). The 2014 aerial surveys show that the number of killed trees from bark beetles spiked in 2014 following defoliation activity (Mehmel, 2015).

Mistletoe will persist across the landscape and continue to provide habitat for flying squirrels. ‘

Landscape Departures

Alternative 1 maintains a highly departed landscape condition. Only natural disturbances would alter the amounts, composition, and configuration of different cover types. Because the intensity, duration, and scale of natural events is random, and the landscape is highly departed; long-term sustainability of the current forest structure/cover type is unlikely.

Treatments in Riparian Forest

All tree canopy layers would be retained in riparian reserve. Because of high tree densities, heavier surface fuels, and alignment with topography, wildfire in riparian could kill many large trees, reduce shade, and consume most downed wood under 90th fire percentile conditions. Both plantations and YFMS forest structure would have degraded diameter growth because of over-stocked conditions.

Under a simulated 90th percentile fire, trees over 20" dbh do not survive the fire. Crown closure recovery would likely depend on sprouting hardwoods along stream banks. Air temperature, surface temperature, and solar radiation would increase after stand replacement fire. Higher stream temperatures may result.

Alternative 2 - Revised Proposed Action*Recruitment of Large Trees*

In the absence of wildfire, treatments would yield large tree densities of 19 and 8 trees per acre respectively in the ponderosa pine and mixed conifer forest types, in 50 years.

Both thinning and burning treatments would reduce crown bulk densities to levels that would not support crown fire. Effects of a simulated 90th percentile fire on stand structure one year after treatment, would be moderate. The post fire stand condition would leave many live trees that can potentially grow into a large size class. The density of large trees in 50 years would be approximately 18 and 8 trees per acre for the ponderosa pine and mixed conifer forest types, respectively. These trees would provide shade, seed, and cover for wildlife and ameliorate hot, dry conditions post fire.

If treated acres were to re-burn, lower intensity fire is expected due to reduced surface and canopy fuel loading. Trees >20" dbh would have a greater chance of survival.

Post 90th Percentile Fire Effects on Crown Closure

Crown closures in the natural fuels underburn areas would average 50% after treatments. In all treated acres, most surface fuels < 3" would be removed, this would further reduce stand replacement fire risk. In the commercially thinned and underburned stands, the post treatment crowning index (wind speed needed to generate a crown fire), is 47 mph for Ponderosa pine and 37 mph for the mixed conifer type Table 3.9). When a simulated 90th percentile fire is applied to treated stands (one year following treatment), post-fire crown closures would be 29% and 38% respectively for the ponderosa pine and mixed conifer cover types. The simulated fire would kill few trees >20" dbh.

If treated acres re-burn, lower intensity fire is expected due to reduced surface and canopy fuel loading.

Table 3.9. Crowning index (wind speed needed to generate a crown fire, with no treatment (Alt 1) and after Alt 2 treatments), percent mortality after a simulated 90th percentile fire one year after treatment, and predicted out year fuel loading approximately 20 years after the fire.

Alternative – Cover Type	Crowning Index Wind Speed (mph)	Percent Mortality from 90 th Percentile Fire	Out year Total Surface Fuel Loading, Tons / Ac. @ Yr. 2037
Alt. 1 Ponderosa Pine	24	79%	32
Alt. 1 Mixed Conifer	14	92%	44
Alt. 2 Ponderosa Pine	47	11%	9
Alt. 2 Mixed Conifer	31	13%	12

Culture of Late Successional Habitat

Late successional forest structure would be actively cultured in the patches described above. Treatments would include mosaic underburning and planting to remove ponderosa pine and restore the indigenous mix of species (Douglas-fir and grand fir). Mastication thinning in stands #110, and #109 would reduce tree densities and stimulate growth of residual trees, and also restore a more appropriate mix of tree species to these site. Restoration of both patches would in time, result in larger contiguous blocks of dense lsh, without fragmentation.

Legacy tree protection on 509 acres would help preserve at least some large tree structure in the event of wildfire. Protection of these trees would preserve the most genetically fit seed sources for these particular sites, and provide shade for regenerating seedlings after a fire.

Approximately 4900 acres in the YFMS and stem exclusion closed canopy (SECC) structure classes would be thinned and/ or underburned to densities that would promote large tree growth and reduce risk of running crown fire across the landscape. These treatments when combined with mastication thinning (90 ac), non-commercial thinning (21 ac), and aspen regeneration (18 ac); would help make this landscape less prone to catastrophic crown fire and more capable of sustaining patches of late successional forest.

Planned maintenance underburning under this project (and subsequent maintenance burns repeated at 5 to 10 year intervals) would help limit understory development and prolong the accelerated growth rates that would result from initial treatments. Maintenance underburns would randomly kill fire intolerant fir regeneration, marking large tree structure more sustainable. Underburning increases soil pH, nutrient availability, decreases tree densities in the smaller size classes, and reduces water loss through tree leaves and needles. Underburning would create a more fire-tolerant forest because heat stress stimulates growth of thick, fire proof tree bark (Agee 1998). The net effect would be accelerated growth of residual trees (Eriksen et al. 2008).

In treated stands, the simulated 90th percentile fire one year after treatments would result in retention of dominant and co-dominant trees that may attain large tree structure within 40 to 50 years of the initial treatment.

Insects and Disease Patterns

Alternative 2 would thin 1049 ac of the ponderosa pine cover type to a 30-40% crown closure and 431 acres of the mixed conifer type to a 40%-50% crown closure. In the ponderosa pine type on dry sites, the rate of tree growth would largely remain below bark beetle threshold. After thinning, these stands could still be attacked.

In the mixed conifer type, thinning to 40%-50% crown closure would provide enough growing space on moist sites to grow at rates > 1"/decade, this would allow trees to "pitch out" beetle attacks. Fine scale unthinned clumps, complex clumps, protection buffers and riparian reserves would continue to provide habitat for bark beetles.

Harvesting activities and underburning on 4797 ac is likely to damage some reserve trees. Approximately 2-3 trees per acre may become snags after underburning due to bark beetle attack. These will contribute to long-term snag retention objectives.

Some mistletoe structure would be maintained as habitat for wildlife. Mistletoe-infected Douglas fir trees over 20" DBH may be girdled (to create snags) if they threaten adjacent uninfected trees. In some situations, mistletoe trees would be retained in leave clumps surrounded by alternate species or crews may prune lower brooms if only the lower 1/3 crown of the tree is infected. In other situations, mistletoe trees may be marked for removal if they are fuel ladders with higher priority large and old leave trees just upslope. In situations where single mistletoe trees exist on upper slopes with receptive mid stories below, there will be a strategy to retain more alternate species in the tree marking below the infected trees, and retain the largest infected trees. One or a combination of containment methods may be used. In general, the effect of thinning on mistletoe is broom expansion; because increased sunlight would stimulate broom growth (Goheen et al. 2006). Mistletoe retention would preserve important habitat structure for birds (e.g., ruffed grouse, spotted owl, and northern goshawk) and arboreal rodents (such as the northern flying squirrel, an important prey species for northern spotted owl) (Bull 2004).

Landscape Departures

Treatments are designed to reduce departures and make the landscape more resilient. Treatments would initially create 4947 and 5166 acres of stem exclusion open and stem exclusion closed canopy forest structure. The resulting mosaic of vegetation and fuels would be more resistant to stand replacement fire (Table 3.10). For additional discussion of departures, see the Silviculture Specialist Report.

Table 3.10. Effects of treatments on departed landscape metrics for the Swauk Pine analysis area. Shaded cells indicate movement towards the historic—and more sustainable—condition.

Cover by Structure Type	Percent of Landscape			Patch Density (#Patches / 100 ha)			Mean Patch Size (ac)		
	Current	Historic	Alt 2	Current	Historic	Alt 2	Current	Historic	Alt 2
Young Forest Multi-Story (Grand fir)	5.87	0.11	5.64	27	0	18	100	283	190.
Young Forest Multi-Story (Douglas-fir)	22.17	17.97	15.4	136	40	77	132	412	122.
Stem Exclusion Open Canopy (Ponderosa pine)	15.8	35.84	20.1	149	114	140	65	408	87.
Stem Exclusion Open Canopy (Douglas-fir)	4.72	10.5	12.56	149	121	86	34	170	51
Old Forest Single Story (Ponderosa Pine)	1.75	2.16	1.75	4.5	5	2	20	233	30.
Old Forest Multi-Story (Douglas-fir)	0.14	2.06	.145	36	15	5	30	121	20.

Alternatives 2 would repair several departed metrics and move the landscape towards a higher level of resilience. Overly abundant YFMS structure would be reduced. A deficit in stem exclusion open canopy (SEOC) structure would be eliminated and the mean patch size for this type would increase, decreasing the abundance of forest structure that would support running crown fire and/or spruce budworm populations. Patch sizes would increase for all structure types, reducing edge density.

Thinning would promote large tree growth and recruitment on 2758 acres. These acres would grow into old forest single storied (OFSS) or old forest multi-storied habitat (OFMS) habitat in 40-50 years, with trees > 25" DBH.

Treatment areas are strategically planned around existing late successional habitat, to better protect this habitat from wildfire. Existing fragmented patches of late successional habitat are treated by thinning to restore the appropriate cover type, ultimately reducing fragmentation and over time, creating a larger block Old Forest Multi-story structure.

Treatments in Riparian Forest

Alternative 2 would treat the outer fringes of riparian reserves except for unstable areas and certain microsites with greater potential to influence stream temperature. A total of 274 acres would be treated within Riparian Reserves (20% of all proposed commercial thinning). YFMS structure in the riparian reserve would be thinned to a 50%-60% crown closure, making these areas less of a conduit for fire movement across the landscape. Large trees would likely persist as future shade and seed sources. Passive use of fire in the riparian zones would reduce surface fuel loading leaving patchy distribution of fuels.

Modeling showed no real difference ingrowth rates trees in the 8" dbh size class, before and after thinning to 50% crown closure. Modeling indicated that ingrowth of 14" dbh trees would occur 35 years faster than a no-thin regime.

Outer fringe of riparian reserves are thinned and underburned to 50-60% crown closure. The simulated 90th percentile fires would not be stand replacing and many trees less than 20" dbh would survive the fire. After the simulated fire, a crown closure of around 35% is maintained, and by 2055; crown closures reach 50%. Trees that survive a 90th percentile fire represent future sources of large wood and shade in the post-fire riparian forest. Riparian conditions would be moderated by this crown closure with the passing shade effect of burned, full and partial canopy trees retained on the overstory.

Effects from Proposed Restoration Actions under Alternative 2

Hill-climb restoration and proposed trail relocations would reduce soil erosion and enhance forest cover, shrub, and forb communities in the affected stands.

Establishing a sustainable road system would not result in loss of access for purposes of long-term vegetation management. Most roads to be decommissioned or closed are unauthorized, and not used for that purpose. Long-term vegetation management needs were considered during Travel Analysis.

The water conservation that would result from approximately 50 site-specific aquatic restoration actions would have a positive effect on forest growth and restoration, because of improved ground water storage and retention through the growing season. The water demand from trees would grows through the summer, and increased storage and retention of ground water would help counter balance this trend.

Cutting and piling of green trees in riparian reserves for large wood replenishment may attract bark beetles. Green trees with live tissue are a food source for bark beetles, particularly green trees >16" dbh. If the cutting and placement of wood occurs after summer flight of bark beetles (late August), and if concentrations of trees are limited to <10 trees/100' of stream reach, the risk of generating a Douglas-fir beetle outbreak would be low. Springtime cutting and placement of wood could generate a secondary beetle population that would then emerge and kill adjacent standing green trees in riparian forest. The expected ratio of infested cut green trees to standing green trees is 3:1, meaning that typically, one additional green standing tree is infested for each 3 trees used in riparian downed wood restoration (Mehmel, pers. comm.).

Consistency Finding

All proposed silvicultural treatments would be beneficial to the creation and maintenance of late successional habitat in LSR, because tree thinning combined with prescribed fire create a more sustainable forest structure on the landscape.

Proposed thinning and underburning is consistent with previous guidance from REO for these types of actions in LSR. It maintains and restores habitat within the breeding radii of known owls, and is consistent with the Wenatchee National Forest LSRA (U.S. Forest Service 1997).

Treatments are based site-specific silvicultural stand exams, and prescriptions prepared by a certified Silviculturist. Needs of other resources are addressed, including protection of high quality spotted owl habitat and riparian forest. Alternative 2 meets all requirements for silvicultural treatments under the 1990 Forest Plan.

The Okanogan-Wenatchee National Forest Restoration Strategy (USDA Forest Service 2012) was followed and informed the design of this project.

The project will use revenues from forest restoration byproducts to help fund restoration goals. It is located in the Collaborative Landscape Forest Restoration Area known as Tapash, designated under the umbrella of the Omnibus Public Land Management Act of 2009. A collaborative approach was utilized during planning of this project (See EA Chapter 1).

Wildfire Suppression and Air Quality _____

Introduction

Risk of wildfire was addressed previously in the context of forest vegetation. This section considers wildfire in a different context—the potential for wildfire ignitions from human actions, and the capability to both suppress and prevent wildfires, given air quality concerns and forest infrastructure (roads). Concerns regarding the effects of proposed road actions on fire suppression capability were raised during scoping, and are addressed in this section.

Regulatory Framework

- Clean Air Act of 1963 (as amended in 1970, 1977, and 1990) (CAA). The CAA is a legal mandate designed to protect the health and welfare of the public from the effects of air pollution.
- Washington Clean Air Act requires a smoke management plan and prior approval by the Washington State Department of Natural Resource (DNR) for all prescribed burning.
- A forest goal for maintaining air quality is to: “Prevent significant adverse effects of air pollution and atmospheric deposition on Forest resources through compliance with the Clean Air Act and state and local regulations.”(Forest Plan page IV-3).
- Other Forest Plan standards and policies regarding fire prevention and suppression, including:
 - All wildfires will receive a prompt suppression response.
 - Priorities for protection will first be human life, followed by public safety and improvements.
 - The prevention of human caused wildfires will continue to be a management priority.
 - Prescribed fire will be used to modify vegetation in an effort to minimize the risk of wildfires.
 - Prescribed fire will be used as a resource management tool when appropriate planning indicates it is an efficient and effective option to implement. .

Methods and Scale of Analysis

Experience from recent wildfires on the Cle Elum Ranger District and Okanogan-Wenatchee National Forest are the basis for this discussion.

Existing Conditions

Swauk Creek watershed has a long history of natural fire occurrence. Land-use and land management changes throughout the dry and mesic forest types of the eastern cascade mountain range, starting in the late 1800's and early 1900's coincided with a notable decline in fire frequency and fire size (Wright and Agee 2004). Over a century later, the fire frequency is still in decline, however, fire sizes are now increasing in size because of denser forests. A study conducted in the Swauk watershed by Everett et al. (1997) revealed that the fire-free interval prior to European settlement was 14.3 to 19.6 years. He also noted that the majority of the stands within his study area were 3 to 8 fire-free intervals divergent from pre-European conditions.

In the Teanaway River watershed, immediately to the west of the Swauk Creek watershed, Wright and Agee (2004) found that the most common fire return interval was eight years across all of their study sites. Both watersheds are very similar in physical setting, fuels, and weather. The following table from Wright and Agee (2004) shows the mean fire interval (MFI) for several plant association groups found in the Teanaway watershed. These same plant associations groups can also be found in the Swauk watershed.

Table 3.11. Fire Interval mean and range, by plant association group. These data are from fire history sites in the Lower Teanaway River Drainage. Source: Wright and Agee (2004).

	Plant Association Group		
	Dry Douglas-fir	Dry grand fir	Wet grand fir
Mean Fire Interval (MFI)	18.8	20.6	23.9
Fire Interval Range	34.3	39.9	34.7

Widespread timber harvesting began to occur in the Swauk Creek watershed in 1930 and continued through the mid-1940s as Cascade Lumber Company (became Boise Cascade Corporation in 1957) harvested land under its ownership in the watershed. Cascade Lumber also had timber rights to timber on National Forest lands in the watershed and harvested some of the federal land, as well (The Pine Tree Express, 1990). Timber harvesting has continued since the mid-1940s to the present, but at a lower rates due to market fluctuations and increasing needs for habitat protection. The significance of early timber harvests was the removal of the large diameter ponderosa pine, western larch (tamarack), and Douglas-Fir trees that were the most resistant to wildfire damage and mortality. The loss of the large-diameter overstory trees, coupled with the increasing effectiveness of wildfire suppression as the 20th century progressed, and timber stand improvement efforts, has allowed the vegetation pattern in the drainage to move toward the over-abundance of young forest, multi-storied (YFMS) conditions that has reduced the resiliency of the various ecosystems to respond to disturbance, such as wildfires. See previous discussion under Forest Vegetation.

In regard to air quality, the Clean Air Act defines National Ambient Air Quality Standards (NAAQS) as levels of pollutant above which detrimental effects on human health and welfare could occur. Particulate matter or PM is the major pollutant of concern from wildfires and prescribed fires. PM means any airborne finely divided solid or liquid material with an aerodynamic diameter smaller than 100 micrometers (microns). The small size of PM in wood smoke allows some particles to be carried deep into the lungs. Most particles larger than 10 microns are intercepted in the nose and mouth through inertial impaction. The Environmental Protection Agency has identified PM₁₀ and PM_{2.5} particle sizes as the standards for evaluating emissions and its effect on human health. PM₁₀ (coarse) particles are those particles in smoke less than 10 microns in size. PM_{2.5} (fine) particles are those particles in smoke less than 2.5 microns in size.

Particulate matter, both coarse and fine can be inhaled. These particles are too small to be filtered out by the human respiratory system. These small particulates can cause respiratory problems, especially to smoke sensitive portions of the population. In addition to health problems, PM can cause reduced visibility. The State Implementation Plan (SIP) provides the means by which goals of the Clean Air Act are to be attained. The Clean Air Act also contains a provision that provides for prevention of significant deterioration (PSD) of air quality in areas that currently have very clean air. Three air quality classes were established (Class I, II and III). The classification of an area determines the amount or "increment" of air quality deterioration that is allowed over a baseline level. Class I areas have the smallest increments and therefore allow the least amount of air quality deterioration.

Environmental Consequences

Direct and Indirect Effects

Alternative 1 - No Action

Effectiveness of Prescribed Burns and Wildfire Suppression Efforts

No burns would be conducted. No roads would be decommissioned or closed. In this project area, however, access for fire suppression would not be an issue. Under certain conditions beyond our control (wind, weather, multiple fires burning simultaneously), wildfire suppression efforts may be challenged by the magnitude and intensity of wildfire or the availability of resources with which to attack a fire.

Air Quality

Without treatments, the probability of a large, high-intensity wildfire would remain high in this watershed. A wildfire can greatly reduce air quality and visibility, as demonstrated in recent nearby high severity wildfires. Over the last 20 years state air regulators and scientists have measured air impacts from wildfires that exceed National Ambient Air Quality Standards (NAAQS) in urban areas. The 1994 wildfires near Wenatchee, Washington produced 24-hour concentrations of PM₁₀ that were more than double the federal health standards, and these conditions persisted for days (Liberty Hazardous Fuels Reduction EA 2006). The wildfires of September 2012 (Table Mountain Complex & Wenatchee Complex) created similar conditions in which the very young and elderly were told to limit outside activity and school athletics were curtailed to limit physical exertion under extremely smoky conditions. The "smoke siege" lasted for several weeks. Summer inversions in Eastern Washington increase the impact on ambient air quality from wildfires.

Alternative 2 - Revised Proposed Action

Effectiveness of Prescribed Burns and Effects on Wildfire Suppression

Thinning and prescribed fire (Rx fire) has been documented to be very effective in reducing the severity of wildfire effects in mixed conifer forests in eastern Washington. A study in Okanogan County documented the effect of thinning and burning within the 2006 Tripod Complex fires. Over 57% of trees survived in thin and Rx burn units compared to 36% in thin only units and 14% in sampled untreated areas within the burned area where over 60% of the area burned by the fires was classified as moderate to high severity (Prichard et al, 2010). Thinning is effective in raising canopy base height and lowering canopy bulk density, thereby reducing the probability of crown fire to propagate and sustain itself in the canopy. Applying prescribed fire following thinning can further reduce fuels and fire hazard by consuming surface fuels, killing tree seedlings and saplings that can become ladder fuels, and further raising canopy base height (Harrod et al, 2009).

The following photos demonstrate the effectiveness of previously thinned and burned areas reducing the severity of wildfires impacting national forest lands (Richy Harrod, Deputy Fire Staff Officer/Fire Ecologist, Okanogan-Wenatchee National Forest, personal communication).



Forest Road 9712, near Beehive Reservoir. 2012 Wenatchee Complex wildfire spread up Mission Creek drainage and dropped to the surface and was stopped along the road. Area was previously thinned, piled, and burned in 1990s. Area was treated with prescribed fire maintenance burn in 2009. USFS Photo



Lost Project Area, Tonasket Ranger District, Okanogan-Wenatchee National Forest. This area was thinned and burned in late 1990s. One of the Okanogan County wildfires of 2015 spread to this area and dropped to the surface and was stopped by the road visible in the lower right portion of the photo. USFS Photo

Prescribed fire alone is less effective than thinning for modifying canopy fuels, but burning can greatly reduce saplings and small trees. Prescribed fire effectiveness for modifying overstory trees would be limited unless prescriptions can be designed to produce hotter fires while maintaining safety and control. This can be accomplished by burning when fuels are drier and fire weather is more favorable, but such conditions may be difficult to realize, given the availability of such conditions, and planning and staffing limitations. As a result, it will be necessary to plan subsequent burns to consume additional fuels and cause additional tree mortality. Subsequent burns may also be the least expensive option compared to other treatments (Harrod et al. 2009). As part of this project, a maintenance burn would be implemented within 10 to 15 years of initial underburns. Subsequent burns may also be needed at 10 to 15 year intervals to move the condition toward the desired condition (Battaglia et al. 2008). Subsequent burns would require new environmental assessment.

Road Access for Fire Suppression

In response to Scoping Comment Issue Number 5 (Appendix B), during Travel Analysis for this project, the Cle Elum Ranger District Fire Management Officer participated in the interdisciplinary rating of risks and benefits associated with every road in the planning area, including its value for fire suppression and hazardous fuels management. The amount of road proposed for closure or decommissioning is small in comparison to the total amount of open road. Most road segments proposed for closure and/or decommissioning are short spur roads that access very small portions of the project area. Removing them would have very little effect on fire suppression operations for the following reasons: First, firefighters employed by the US Forest Service (USFS) and Washington Department of Natural Resources (WA DNR) are trained and expected to hike to wildfire suppression actions whether they are ground-delivered (fire

engines and hand crews) or aerial-delivered (helitack, heli-rappellers, or smokejumpers). Second, there is a direct spatial relationship between roads and wildfire occurrence with more fires occurring near roads than in backcountry or wilderness areas.

An examination of the spatial relationship of roads to wildfires found that 88% of all wildfires nationwide are caused by humans. Of these human-caused wildfires, 95% occurred within ½ mile of a road. Over 90% of all wildfires from all causes occurred within ½ mile of a road. In Washington State, the relationship between human-caused wildfire occurrence and distance from road was actually stronger than in the US in general. Sixty-nine percent of the human-caused wildfires were within 200-meters of a road and over 96% were within ½ mile of a road (Morrison, 2007). From this information, it is easy to infer that a reduction of the amount of miles of road in the project area will result in a potential reduction of human-caused wildfires.

In response to Scoping Issue Number 7, the availability of roads would not reduce opportunities for activities such as prescribed burning. The proposed action includes a future maintenance prescribed fire treatment on over 4,000 acres in the project area. The maintenance burn would occur after all proposed road closures and decommissioning actions have been completed.

In response to Scoping Issue Number 8, the proposed road closures and decommissioning do consider needs of laws enforcement and search and rescue. The main road systems in the project area, FS Road 9712 and 9718 will remain open which will allow immediate road access into the Williams Creek drainage as is currently available. Closing and decommissioning short spur roads and segments will still allow foot access into those areas by both the recreating public, law enforcement, and search and rescue. If criminal activity and lost or injured parties requires access into unroaded areas, access by foot, horseback, helicopter, and/or over-the-snow vehicles would still be available.

Cumulative Effects

There are no foreseeable actions that would in combination with Alternative 2, result in a cumulative effect to wildfire prevention and suppression capabilities, or air quality in the Swauk Pine Restoration Project Area.

Consistency Finding

Results of similar restoration projects elsewhere on the forest indicate that treatments under Alternative 2 would be highly effective at reducing wildfire risk (an objective of the 1990 Forest Plan). Prescribed burn plans would address smoke management, and burns would not be ignited without prior approval from the Washington Department of Natural Resources. Therefore, Alternative 2 would meet requirements of the Clean Air Act, and the Washington Clean Air Act.

Botanical Species _____

Introduction

Ground disturbance caused by project activities may promote colonization and spread and invasive plants, or alter habitat for protected plants and botanical species of concern. Proposed treatments may also create or enhance habitat for native plant species of concern through retention of down wood, opening of forest canopy, protection of microhabitats, and treatment of existing invasive plants.

Regulatory Framework

- 1990 Forest Plan standards and guidelines (as amended 1994) require field survey for Threatened, Endangered, Sensitive, and Proposed plant species; and also require pre-disturbance surveys and protection of known sites for a number of vascular and non-vascular plants, lichens, bryophytes, and fungi designated as “Survey and Manage” under the Northwest Forest Plan.
- The Record of Decision Pacific Northwest Region Invasive Plant Program (USDA Forest Service 2005) (Invasives ROD) amended the 1990 Forest Plan, expanding the list of approved herbicides that can be used and establishing new standards and guidelines for their use.
- The Noxious Weed Control Act *and*
- Executive Order 13112 Invasive Species both require consideration of invasive plants for projects on National Forest System land.
- The Forest Plan requires a noxious weed assessment and prevention plan. For details, see the Botany Specialist Report (SR) page 3.
- Forest Service Manual (FSM) 2670 direction requires preparation of a Biological Evaluation (BE) addressing potential effects to Forest Service Sensitive species. Projects may not result in downward population trends that would lead towards federal listing of any Sensitive species.
- Section 7 of the Endangered Species Act requires preparation of Biological Assessment and consultation with the U.S Fish and Wildlife Service for actions that may adversely affect federally listed species or their designated critical habitats. For additional details, see the Botany Specialist Report.

Methods and Scale of Analysis

Actions were evaluated for immediate short-term (0 to 5 years) and long-term (>5 years) impacts. All treatment areas were surveyed by professional botanists for presence of invasive plants and also rare and uncommon botanical species (federally listed Threatened and Endangered plant species, proposed or candidate species for federal listing, and species listed as Sensitive or Survey and Manage in the Pacific Northwest Region). The Washington State Heritage Program Database (Heritage) was consulted for locations of documented sites. Field Guide for Forested Plant Associations (Lillybridge et al. 1995) was used in the field to identify forest habitat type and to assess potential suitability for rare plants.

Existing Conditions

Rare and Uncommon Species

Based on Heritage data and an assessment of habitats present, 104 Survey and Manage species and 66 Sensitive Species occur or potentially occur in the Project Area (Botany Specialist Report (SR) Table 1.1). Potentially suitable habitat is present for 3 federally listed species, including showy stickseed (*Hackelia venusta*, Endangered), Wenatchee Mountains checkermallow (*Sidalcea oregana* var. *calva*, Endangered) and Ute ladies'-tresses (*Spiranthes diluvialis*, Threatened).

No Threatened, Endangered, Proposed species or Forest Service Sensitive species were detected during field surveys. Four species of concern (3 state Sensitive species and 1 Survey and Manage species were documented in 13 stands).

Invasive Species

Field surveys documented 9 species of invasive plants in the Project Area, with 136 infestations over nearly 278 acres.

Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

Rare and Uncommon Species

There would be no direct impacts (negative or positive) to documented sites or potential habitats for any Threatened, Endangered, Proposed, Forest Service Sensitive, or Survey and Manage plants, or the 3 observed state Sensitive plants. Failure to address the growing risk of high intensity fire, however, may indirectly affect all rare plants. Uncharacteristic fire may alter soil characteristics and remove entire plant communities. In the absence of disturbance, changes to suitable habitat may occur through changes in the species composition of plant communities and natural succession.

Invasive Species

Current invasive plant populations would increase over time at a steady rate. Because of ongoing uses of system and non-system roads, the risk of new invaders would remain high.

Alternative 2 - Revised Proposed Action

Rare and Uncommon Species

Project activities would not affect federally listed or proposed or Forest Service Sensitive plants. As required mitigation, the known locations for 3 state-listed Sensitive plants and one known Survey and Manage species would be buffered from disturbance and herbicide treatments, and thinning prescriptions were modified to maintain suitable habitat conditions. Project activities around any newly detected sites would be halted until a Forest Service botanist identifies necessary measures for protection.

By reducing risk of large and severe fire, the project would indirectly benefit all rare plant species. Restoration of the inherent mixed severity fire regime which includes low intensity fire would allow native plants to better compete against invasive species. Planned aspen regeneration around Dunning Meadows may promote re-establishment of Wenatchee Longspur (a state-listed plant), which is being out competed by Canada thistle. Treatments that provide for appropriate retention or augmentation of snags and down wood would benefit the majority of species of concern.

Planned low intensity underburns reduce the potential for negative fire effects on native plants, including loss of seed bank. Thinning and burning in late summer and fall would have the least impact on native plants, lichens, bryophytes, and fungi. Fruiting or spore production would be underway, or if late enough in fall, plants may be entering their dormancy phase.

Invasive Species

Ground-based logging disturbs more ground than skyline yarding, but both create conditions conducive to the spread of invasive plant species through seed dispersal. Prescribed fire can exacerbate the establishment and spread of invasive plants (Keeley 2006). Using slash mats in commercial thinning and mastication stands would reduce the risk of invasive plant invasion due to the reduced ground disturbance that would

normally create bare ground and compaction. To mitigate and allow the establishment of native species to outcompete weed establishment, all disturbed ground would be seeded with a District Botanist approved seed mix of native grass and forb species suitable for the Swauk Watershed.

All mapped invasive sites would be treated using six herbicides and rates already approved for use in the Pacific Northwest Region. The overall amount of herbicide used would be minimized by spot treatments targeting only invasive plants. Protective buffers would be established around all perennial and intermittent streams. Buffer widths would vary according to herbicide used and presence of water. See the Botany SR (pages 3-4) for buffers and restrictions for each herbicide.

Risks to human health from herbicide use would be mitigated by required notification to the public prior to use, restricted weather conditions for application of herbicides, strict state licensing requirements for herbicide applicators, and use of colorants to minimize human exposure on freshly treated sites.

As directed by FSM 2070.3 (2008), the use of locally adapted, genetically appropriate native seed and/or plant propagules is required on all restoration and rehabilitation sites. Use of these native plant materials can contribute to not only overall forest resiliency but can also decrease the spread of invasive plants (Berger 2005). One major contributor to invasive plant invasion is the burning of slash piles that become high intensity burns. Studies have shown that these small areas provide habitat for noxious weed establishment (Haskins and Gehring 2004).

Cumulative Effects

It is not known if or to what extent previous harvest activity and road construction in treatment areas affected rare plant populations. There are no reasonably foreseeable future actions in treatment areas that would (in combination with this project) result in a cumulative effect to rare plant populations or habitats.

Effects of past and present actions on invasive species populations are reflected in the description of existing conditions. There are no foreseeable future actions that in combination with Alternative 2, would result in a cumulative effect to invasive species in the Swauk Pine Restoration Project Area.

Consistency Finding

Required field surveys were conducted, and no federally listed or R6 Sensitive Plants were located in proposed treatment areas. Required mitigations include provisions for protection of any rare and sensitive species discovered during project implementation.

Alternative 2 is consistent with the Executive Order 13112 and all Forest Plan requirements for management of invasive plants, because invasive plant populations have been mapped and Best Management Practices would be implemented to help prevent the spread of existing populations.

Wildlife

Introduction

While all wildlife species are important to consider and many are analyzed in this report, the northern spotted owl and the habitat upon which it depends played a large role in the early planning for this restoration project. The revised recovery plan for the northern spotted owl (USFWS 2011) outlines a habitat management strategy for the fire-prone forests on the east side of the Cascades Range. The strategy for

spotted owl recovery in east-side forests is meant to be successful on its own and does not rely on other conservation or management plans, a significant shift from previous conservation strategies. The habitat management strategy described in the revised recovery plan is intended to maintain spotted owl habitat within an environment of frequent natural disturbances. No habitat reserves are identified, as disturbance regimes are assumed to preclude long-term persistence of static habitat management areas. Rather, a landscape approach is recommended to promote spotted owl recovery within the broader goal of ecological sustainability.

Planning for this project began with an analysis of departures from historic conditions on a landscape scale. These departures informed the desired future landscape condition, the purpose and need for action, and delineation of the project area. Treatments were then proposed to move the project area towards the desired future condition.

Proposed actions include: commercial thinning, non-commercial thinning, prescribed fire, and riparian large wood replenishment that would primarily impact young multi-story forest and accelerate the growth of old multi-story forest and old single-story forest. The resulting landscape condition would be more resilient to natural disturbances including wildfire.

Proposed actions would impact standing and down dead and defective trees, early and late successional forest habitats, riparian forest habitats, and road densities. As a result, this project has a potential to impact 8 of the 10 designated Management Indicator Species (MIS) for the Wenatchee National Forest, as well as several threatened, endangered, and R6 sensitive species and species of concern (See Wildlife Appendix A).

In this analysis, descriptions of population status, habitat needs, risk factors, and viability outcomes for MIS are from *Status of Management Indicator Species on the Okanogan and Wenatchee National Forests*, hereafter referred to as the MIS Status Report (USFS 2011, unpublished report, incorporated by reference).

Regulatory Framework

Forest Plan Direction and Standards and Guidelines

- *Late Successional Reserves (LSR)* are managed to protect and enhance old-growth forest conditions. See previous discussion in Chapter 1.
- The Forest LSRA (U.S. Forest Service 1997) prioritizes treatments for risk reduction in LSR based on spotted owl occupancy and proximity to nests. Actions that affect habitat around known spotted owl locations are restricted, particularly within breeding areas (areas within 0.7-mile of active nests).
- Standards for snag and log retention in the Swauk Late-Successional Reserve (Table 3.13) are based on the best available science—local research by Harrod et al. (1998). The listed ranges exceed levels prescribed in the 1990 Forest Plan.
- *Riparian Reserves*: See overview of forest plan direction in Chapter 1. ACS Objective No. 9 is directly applicable to wildlife (maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.). The following standards and guidelines for Riparian Reserves are applicable to this project and have implications for wildlife (ROD 1994 page C-37):

- RA-2 (keep trees felled for safety reasons to meet coarse woody debris objectives);
- RA-3 (apply herbicides in a manner that avoids impacts that retard or prevent attainment of Aquatic Conservation Strategy objectives);
- FW-1 (design and implement fish and wildlife habitat restoration and enhancement activities in a manner that contributes to attainment of ACS objectives).

Table 3.13. Required levels of snag and down wood retention in Swauk Pine Restoration Treatment Areas.

Source: Wenatchee National Forest Late Successional Reserve Assessment (1997). Because of LSR and critical habitat status, the high end of the desired range would apply in mesic, moist, and riparian wetter settings within the Swauk Pine Project Area. Low and mid-range values would apply to drier sites. Values for areas with no green tree recruitment are included here because of proposed maintenance burning in areas that burned during the Table Mountain Wildfire of 2012. Additional snag requirements are described later under the Primary Cavity Excavator Group.

FOREST VEGETATION GROUP	SNAG DIAMETER CLASS	Areas With Green Tree Recruitment		Areas With No Green Tree Recruitment	
		Snags (no. per acre)	Logs (no. per acre)	Snags (no. per acre)	Logs (no. per acre)
DRY	10"-14"	1.6-3	3-7	1-3	3-10
	15"-19"	1.0-2		4-8	
	20"+	1.1-1.5		6-14	
	All	3.7-6.5		11-25	
MESIC- MIXED	10"-14"	4-10	5-10	3-9	5-10
	15"-19"	2-2		2-4	
	20"+	0.75-2		4-8	
	All	6.75-14		9-21	
MOIST	10"-14"	10-15	25-40	10-15	25-70
	15"-19"	2-6		4-6	
	20"+	2-4		4-8	
	All	14-25		18-29	
RIPARIAN DRY	10"-14"	2-5	7-8	2-5	7-8
	15"-19"	2-5		2-5	
	20"+	6-10		6-10	
	All	12-16		12-16	
RIPARIAN WETTER	10"-14"	12-17	8-40	12-17	8-40
	15"-19"	4-8		4-8	
	20"+	6-10		6-10	
	All	22-35		22-35	

Other applicable standards and guidelines pertaining to individual species are addressed below under the affected habitat type or species group.

The analysis for wildlife is framed by requirements of the **National Forest Management Act (NFMA)**, the **Endangered Act (ESA)**, **Migratory Bird Treaty Act**, and **Executive Order 13186 Responsibilities of Federal Agencies to Protect Migratory Birds**, and Forest Service Manual (FSM) 2670 direction for management of **Sensitive Species**. See the Wildlife Specialist Report for additional details.

Methods and Scale of Analysis

In this analysis, habitat conditions for all wildlife were modeled using ESRI ArcMAP software, and district habitat maps based on aerial photo interpretation. Qualitative assessments were based on field work and general walk-through surveys conducted in fall 2013 and 2014 and the spring and summer 2015. Digitized maps of forest roads and trails were used to analyze effects on grizzly bear core areas and security habitat for other wide-ranging carnivores, deer, and elk.

Impacts to wildlife dependent on dead and defective trees and logs were assessed using synthesized data from the Decayed Wood Advisor (DecAID) version 2.20 (2015)³. Predicted wildlife use given current snag and down wood conditions was based on a limited number of published studies conducted in the east-side mixed conifer habitat type.

The scale of analysis varies by affected habitat type (or species group). Unless stated otherwise, the analysis area is the Upper Swauk sixth field watershed (39,175 acres). The Swauk Pine Project Area (6,483 acres) comprises about 17% of the analysis area. Unless otherwise stated, effects are analyzed for the short-term (immediately following treatments), mid-term (10-25 years following treatments), and long-term (25-50 years following treatments).

Existing Conditions and Effects of Alternatives by Affected Habitat Type

Early Successional Habitat

(MIS: Mule Deer and Elk)

Forest Plan Guidance Specific to Deer and Elk

- Maintain well-distributed forest cover across sub-basins, maintaining cover adjacent to harvest areas, and limiting the size of regeneration harvest areas to achieve maximum deer and elk use (Forest Plan, pp. IV-81-82).

Existing Conditions for Deer and Elk

Local Occurrence and Population Status of Elk

Elk use the Swauk Pine project area in spring, summer, and fall. These elk belong to the Colockum elk herd. The Swauk Pine project area (6483 ac) comprises less than .01% of their core range (Population Management (PMU) 32 (808,607 ac).

Two major wild fires occurred within the Colockum elk herd range in 2012. The Table Mountain Fire and the Taylor Bridge Fire did not burn through core parts of the range, but are expected to slightly change herd distribution over time. The Table Mountain fire in particular burned a large area of high elevation forest near the western edge of the Colockum range. Burned forest is much more open, and the expected increase in forage will likely attract more elk to this portion of the summer range in the near future.

Key management concerns for Colockum elk herd include human disturbance on winter and spring range. The Forest Service has determined that elk populations and habitat on this Forest are widely distributed, and that identified risk factors are being managed (viability outcome “A”, MIS Status Report pages 34-35).

³ DecAid is an on-line compilation of published science on the use of snags and logs by wildlife, and of snag and down wood inventory data in the Pacific Northwest (Mellen-McLean et al. 2012).

Consistency with Forest Plan standards and guidelines would ensure continued viability of elk across the Wenatchee National Forest planning area.

Local Occurrence and Population Status of Mule Deer

Mule deer also use the Swauk Pine Project area in spring, summer, and fall. These deer are part of PMU 32. The population has been increasing over the last few years, but is still below historic highs. Above average precipitation combined with mild winters have helped slightly boost populations.

There are few data on the historic or current condition of the deer range. Fires have probably negatively impacted woody browse in the lower elevations where cheat grass often replaces shrubs after fire. Large fires swept over prime winter range in PMU 32 in summer of 2012, 2013 and 2014. Forage production has been reduced, but no significant winter mortality has been noted yet. When a severe winter does occur, deer are expected to die in large numbers due to inadequate browse above snow (WDFW 2014).

Current Habitat Conditions for Deer and Elk

Winter Range: Winter range is considered the most critical habitat for maintaining populations of both mule deer and elk across the Wenatchee National Forest (MIS Status Report pages 29 and 33). There is no key big game winter range (EW-1) in the analysis area. The nearest EW-1 area is located 2 miles south of the Project Area in lower Swauk Creek.

Spring-Summer-Fall Range: Deer and elk concentrate in the Project Area in April and May. As snowpack recedes and human use increases many elk and deer disperse north and eastward to higher elevation areas with less disturbance from motorized use.

Approximately 32% of the Swauk Pine Analysis Area supports early successional forest and/or forest openings (meadows, grasslands, shrublands or open forest stands) that provide foraging habitat for both deer and elk (Fig. 26 and Table 3.14). About 68% of all capable acres in the Swauk Pine Analysis Area support dense forest structure that provides cover. Restoration of old forest single story structure in drier, historically open stands offers the best chances to increase the quality and quantity of herbaceous forage for elk, and woody browse for deer on National Forest System land. The current ratio of cover to forage in the Project Area is 54% cover to 46% forage.

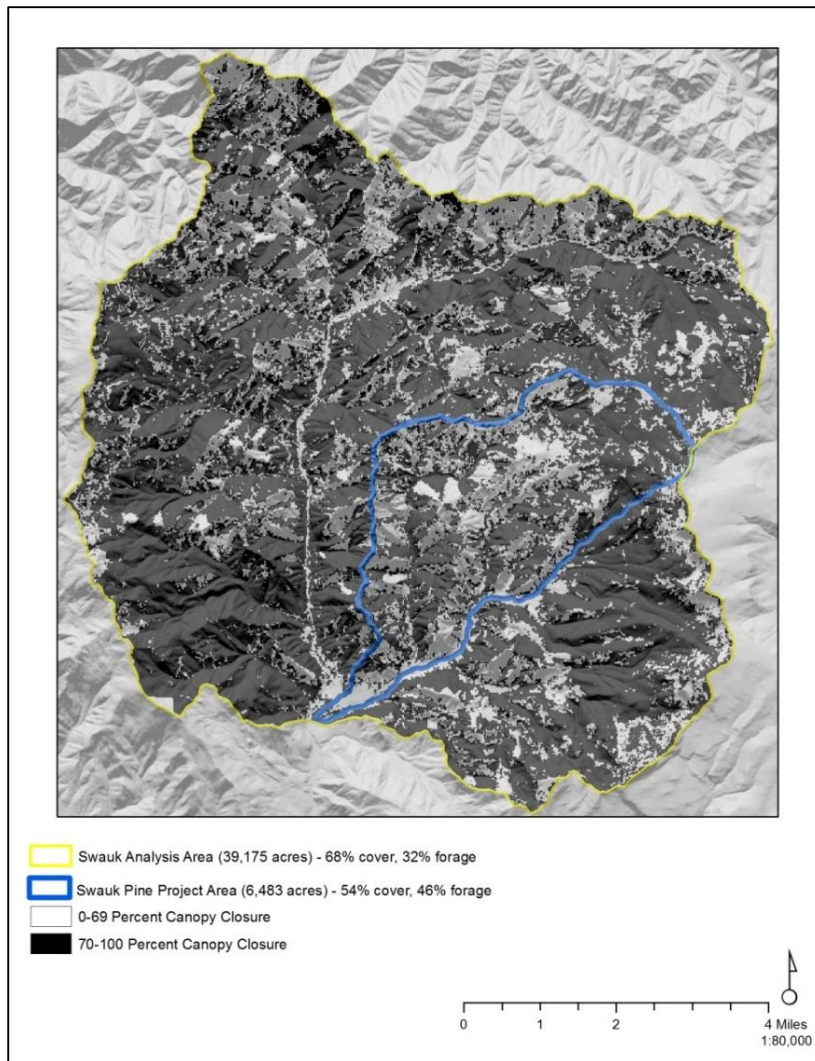


Fig. 26. Existing condition of elk cover and forage within the Swauk Pine Analysis Area.

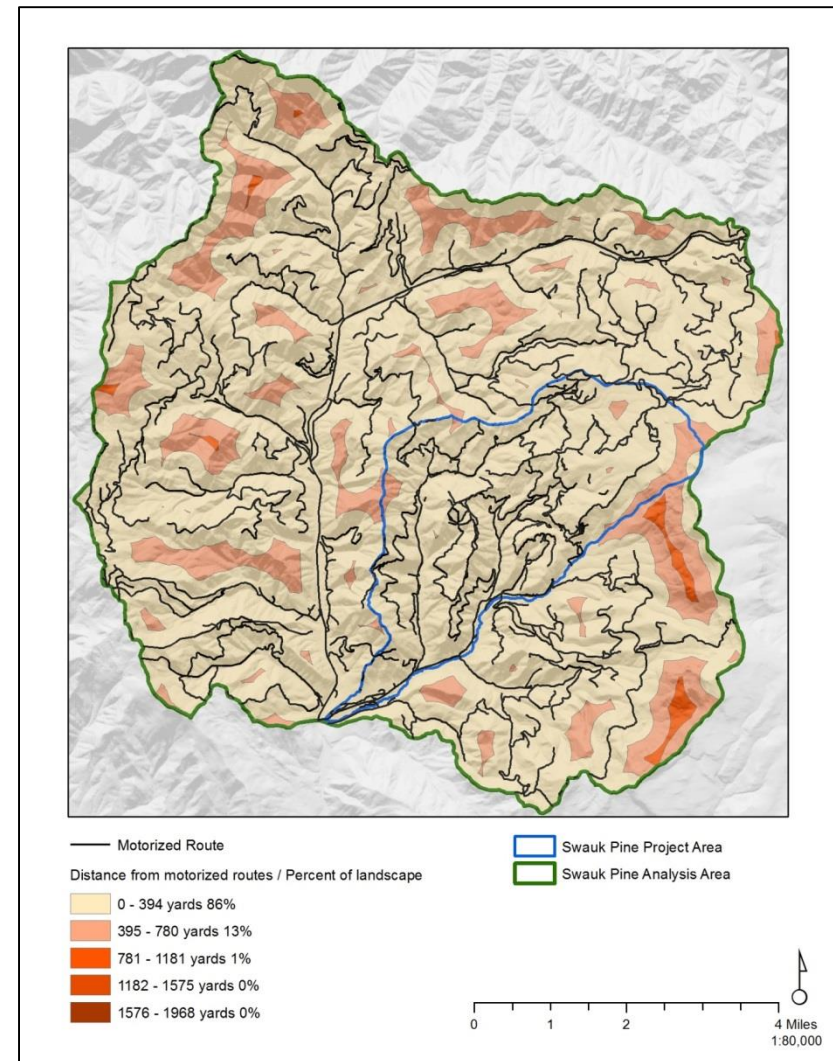


Fig. 27. Distance from motorized routes within the Swauk Pine Analysis Area within 5 distance bands.

Table 3.14. Percent cover and forage for elk in the Project Area and larger Swauk Pine analysis area, under current conditions and after Alternative 2 treatments.

	Project Area		Analysis Area	
	Cover	Forage	Cover	Forage
Current Condition	54	46	68	32
Alternative 2	31	69	65	35

Table 3.15. Distance band analysis for current motorized routes in the Swauk Pine Analysis Area, with an elk habitat effectiveness index based solely on distance from motorized routes (HER-DB) (adapted from Rowland et al. 2000).

Distance from motorized route (yds.)	Proportion of Analysis Area within distance band (A)	Assigned weight for Distance Band (from Rowland et al. 2000) (B)	Value (A x B)
0-394	0.86	0.17	0.15
395-780	0.13	0.33	0.04
781-1181	0.01	0.50	0.00
1182-1575	0.00	0.67	0.00
1576-1968	0.00	0.83	0.00
>1969	0.00	1.00	0.00
Habitat Effectiveness R-DB (Sum of values)			0.19

Habitat Effectiveness: The interspersions of forage and cover and proximity to open roads are better indicators of overall habitat effectiveness for elk, than simple cover-to-forage ratios. Radiotelemetry study of elk cows and calves on the Starkey experimental unit in Oregon indicates that open roads are the single greatest factor affecting elk use of habitat (Rowland et al. 2000). The authors reported a strong relationship between elk habitat selection and distance from open roads, with the probability of elk use increasing with distance from roads. Elk response to open roads diminished markedly beyond a distance of 1969 yards.

In the Swauk Pine Analysis Area, the estimated habitat effectiveness (HE) index for elk based solely on distance from open roads is currently 0.19 (Table 3.15 above). The HE statistic ranges from zero to 1.0, with 1.0 indicating no influence from motorized routes on elk selection of habitat. Eighty-six percent of the analysis area and 95% of the Swauk Pine Project Area is within 394 yards of a motorized route—the distance band closest to roads and associated with the lowest probability of elk use in the Starkey study (Fig. 27).

High use open roads also influence deer use of habitat, although Wisdom et al. (2005) observed that the pattern of mule deer response to open roads and varying levels of traffic is different from that of elk, and that mule deer response may also be influenced by presence of moderate to high densities of elk, as occurs in the Swauk Pine Project Area. In the Starkey study, mule deer generally remained closer to open roads

than elk, and also avoided areas used by elk. Separate habitat effectiveness analysis is recommended for deer, but was not done for this project. Instead, the summer habitat disturbance index from Gaines et al. (2003)—applicable to both deer and elk—is calculated below.

The road index HER-DB (Table 3.15 above) is used here as an index of overall elk habitat effectiveness. Total habitat effectiveness (based on the geometric mean of the road index and 3 other indices (interspersed cover and forage, quantity and quality of forage, and cover quality) was not calculated in this analysis, due to lack of data on the quantity and quality of forage.

Deer-Elk Summer Habitat Disturbance Index: For comparison across the Okanogan-Wenatchee National Forest, Gaines et al. (2003) developed methodology to assess the percentage of deer and elk summer habitat within a watershed that is influenced by roads and motorized trails, using buffer widths that vary according to type of road or trail and level of motorized use. The deer-elk summer human disturbance index for the Swauk Pine Analysis Area is currently 100%—indicating that 100% of the available deer and elk habitat is within the potential zone of influence from a motorized route. On the Okanogan-Wenatchee National forest, levels above 70% indicate a high level of human influence on deer and elk habitat (Gaines et al. 2003).

The low Habitat Effectiveness value (0.19) and high disturbance index (100%) indicate that mule deer and elk habitat in both the Analysis Area and the Project Area is probably not as well utilized as it could be due to disturbance from high use roads and/or the combination of high use motorized roads and trails. The magnitude of this effect may be slightly lower for deer, which can utilize smaller patches of cover near roads.

Direct and Indirect Effects

Alternative 1 – No Action

Forage would continue to decline as stands grow denser in the absence of disturbance. High road density would continue to impact elk and deer use of the Swauk Pine Project Area.

Invasive plant treatments using herbicides would be limited to major arterial roads already “covered” by a previous Forest-wide environmental analysis or the Liberty Hazardous Fuels Reduction Report (See Botany Section). Weed infestations on other Forest roads would continue to spread unabated, reducing the quantity and quality of forage for deer and elk.

Risk of uncharacteristic fire would continue to rise. There is potential for widespread loss of habitat for deer and elk if a large and severe fire occurs within the project area.

Alternative 2 - Revised Proposed Action

Effects to Habitat

Treatments would affect 13% of available deer and elk habitat in the analysis area. Foraging habitat would increase by 3%, but the associated loss of cover (3%) would increase vulnerability to disturbance in some parts of the project area.

Summer and fall habitat effectiveness for deer and elk is already low here due to high density of open roads and motorized trails. Almost all of the newly created forage resulting from treatments is within the zone of influence for high use roads; therefore, benefits to deer and elk from increased forage production may not be fully realized—particularly for elk.

By adding nitrogen to the soil, planned burning would in the short-term, produce highly palatable herbaceous forage for deer and elk. The effect would persist for only a few years following treatments. The open conditions resulting from burning may also result in slightly earlier spring green up—a boon to deer and elk moving off of winter ranges, when human disturbance is relatively low. The patchy nature and variable intensity of the planned natural fuels underburn would also provide high quality forage for deer in the short- and mid-term (Lehmkuhl et al. 2013).

Proposed treatment of invasive plants wherever they occur, with a broader selection of approved herbicides, would help maintain the quantity and quality of existing and new herbaceous forage for elk, and to a lesser extent, deer.

Planned closure and decommissioning of roads would benefit elk by reducing motorized disturbance locally, but nearby open roads would continue to influence elk use of these areas. The road disturbance index would remain high.

Planned construction of temporary roads would slightly (and temporarily) increase the percentage of deer and elk habitat that would be subject to the influence of roads. Construction and use of temporary roads may cause short-term displacement of individual deer and elk from these localities. Temporary displacement of a few animals would not impact deer and elk populations or their long-term use of the area.

Effects from Disturbance

Deer and elk would be temporarily displaced during thinning and burning operations, due to noise disturbance associated with equipment, traffic and human presence, as well as heat, flames, and smoke associated with fuel treatments. Deer and elk use of lightly burned forest would resume quickly, particularly in areas unseen from roads.

Cumulative Effects (Alternative 2)

The high deer-elk summer habitat disturbance index here (100%) reflects the influence of ongoing human activities (almost all associated with roads and trails) on deer and elk. There are no foreseeable future actions that in combination with Alternative 2 would change the influence of roads and cause a cumulative effect to deer and elk.

Effects from previous timber harvest are already reflected in the cover forage baselines described above. One other ongoing project, sheep-grazing under the Swauk Allotment Management Plan, would in combination with Alternative 2; result in a cumulative effect to deer and elk, in the form of reduced availability of late season forage, and exposure to late-summer disturbance. Approximately 1000 ewe-lamb pairs enter the Project Area in August and graze through September. Sheep grazing temporarily reduces the availability of herbaceous forage for deer and elk (and browse for deer), but grazing utilization standards prevent lasting effects on forage production, at least beyond the current grazing season. The presence of large numbers of sheep, as well as a herder and sheep-tending dogs, however, would in itself pose a disturbance to deer and elk, causing localized displacement from preferred foraging habitats in late summer. With depleted forage after sheep have passed, and high levels of human disturbance associated with roads, displacement of both deer and elk from the Swauk Pine Project Area may be prolonged.

Plans to exclude domestic sheep from parts of the allotment for at least two years following treatments prescribed fire treatments would promote faster recovery of vegetation (provided that deer and elk use remains at, near, or below current levels). The cumulative effects arising from domestic sheep grazing would begin about 2 years following prescribed fire treatments, and would persist over the long-term.

Consistency Findings for Deer and Elk

Alternative 2 meets the 1990 Wenatchee Forest Plan standard for maintaining well distributed cover in deer and elk summer range. Therefore, the project provides for the continued viability of mule deer and elk.

Standing and Down Dead and Defective Trees

(MIS: Primary Cavity Excavator Group)

Introduction

In the Swauk Analysis Area, more than 100 species of wildlife use “decayed wood elements” (snags, logs, and branches in all stages of decay, plus root wads, deformed or diseased parts of living trees, mistletoe platforms, hollow trees, forest litter and duff. Effects of management activities on the primary excavator group (woodpeckers) are used to indicate effects on all wildlife that require decaying wood habitat structure.

Forest Plan Direction for Standing and Down Dead and Defective Trees

Recent studies (Rose et al. 2000) indicate that 1990 Forest Plan standards for cavity excavators may be too low to ensure the persistence of all wildlife associated with decaying wood structure. Historic conditions at the landscape scale provide an ecological model for management of decaying wood resources, and are the basis for required snag and log retention listed in the LSRA. They exceed 1990 Forest Plan standards.

Refer to the LSRA for required sizes, lengths, and decay class of snags to be retained. Existing down logs in mechanical thinning areas would not be commercially removed.

Methodology and Scale of Analysis

DecAID wildlife habitat types and structural condition classes were derived from regional forest inventory data (Fig. 28). Gradient Nearest Neighbor analysis of forest inventory data was used to estimate current mean snag density, snag diameter, and percent down wood cover for the Upper Swauk analysis area. (Results may not be reliable at smaller scales). DecAID’s synthesized data for the Eastside Mixed Conifer Forest North Cascades / Rocky Mountains wildlife habitat types is incorporated by reference, and cited throughout this section.

Stand level snag density surveys were conducted in the Swauk Pine Project Area as part of silvicultural stand exams (40 plots among 40 stands) and as part of the planned northern spotted owl prey-base study (234 plots among 12 stands).

Existing Conditions in the Analysis Area

“Vegetative condition” refers to the DecAID wildlife habitat type and DecAID structural condition class. One DecAID wildlife habitat type (Eastside Mixed Conifer Forest North Cascades / Rocky Mountains) comprises 78% of the Upper Swauk analysis area and 85% of the Swauk Pine Project Area (Chappel et al. 2000) (Table 3.16) (Fig. 29).

Eastside Mixed Conifer forest is the focus of this analysis. Douglas-fir is the dominant tree species, but on drier sites ponderosa pine may be co-dominant with Douglas-fir. On mesic sites, western larch and western white pine may reach co-dominant status with Douglas-fir, while grand fir, western red cedar, may reach co-dominance on moister (DecAID Eastside Mixed Conifer Synthesis).

Table 3.16. Vegetative conditions in the Swauk Pine Decayed Wood analysis area based on DecAID wildlife habitat type and DecAID structural condition classes (acres and percent of analysis area).

DecAID Structural Condition Class	DecAID Wildlife Habitat Type*								Analysis Area	
	EMC-NC/RM		EMC-EC/BM		Lodgepole Pine		Montane Mixed			
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
large tree	589	2	472	20	22	3	372	8	1,454	4
small- medium tree	17,879	66	1,451	63	528	79	3,544	74	23,402	67
open	8,517	32	398	17	122	18	869	18	9,906	28
Total	26,985	78	2,320	7	672	2	4,785	14	34,763	100

*Abbreviations: “EMC-NC/RM” = Eastside Mixed Conifer Forest North Cascades / Rocky Mountains, “EMC-EC/BM” = Eastside Mixed Conifer Forest East Cascades / Blue Mountains, “Lodgepole pine” = Lodgepole Pine Forests and Woodlands, “Montane Mixed” = Montane Mixed Conifer Forest.

Forest structure in this type is often highly variable due to topography, soils, and complex history of disturbance. The “open” condition class includes non-forest, sparsely forested areas (10-40% canopy closure) and dense young plantations (up to 100% canopy closure with average trees size below 9” dbh). The large tree condition class encompasses areas with average tree size above 20” dbh, and includes open single-storied stands with large trees on south slopes, and some dense multi-layered stands on north slopes and valley bottoms. It is rare on this landscape—occurring on only 4% of the Swauk Pine Analysis Area. Most of the analysis area (67%) and most of the Eastside Mixed Conifer habitat (56%) is currently in the small-medium tree condition class, with average tree diameters ranging from 10-19”. Most of the areas targeted for treatment under this project are in the small-medium tree condition class.

Snag Densities, Snag Diameter, and Snag Distribution

DecAID analysis shows little difference between current and reference snag and down wood reference conditions (Figs. 30-33). However, the northern spotted owl prey-base study gathered snag and down wood field data in 2012. Observed snag densities ranged from 0 to 182.1 snags per acre with a mean of 16.2 snags per acre. Observed densities of snags greater than 11.8” dbh ranged from 0 to 70.8 snags per acre with a low density mean of 4.1 snags per acre (Table 3.17, Figs. 34-34).

Effects from Past and Present Management Actions

The Swauk Pine Project Area experienced high levels of selective timber harvest in the 1930’s and 1940’s, facilitated by an industrious narrow-gauge timber railroad network (Henderson 1990 and Wildlife Specialist Report). Past selective timber harvest has resulted in lower densities of large snag (≥ 20 ” dbh) and large down wood (≥ 20 ” dbh) than indicated by regional forest inventory data (Table 3.16 above.) Large snag and down wood frequencies in the northern spotted owl prey base plots, however, were too low for confidence in density estimates.

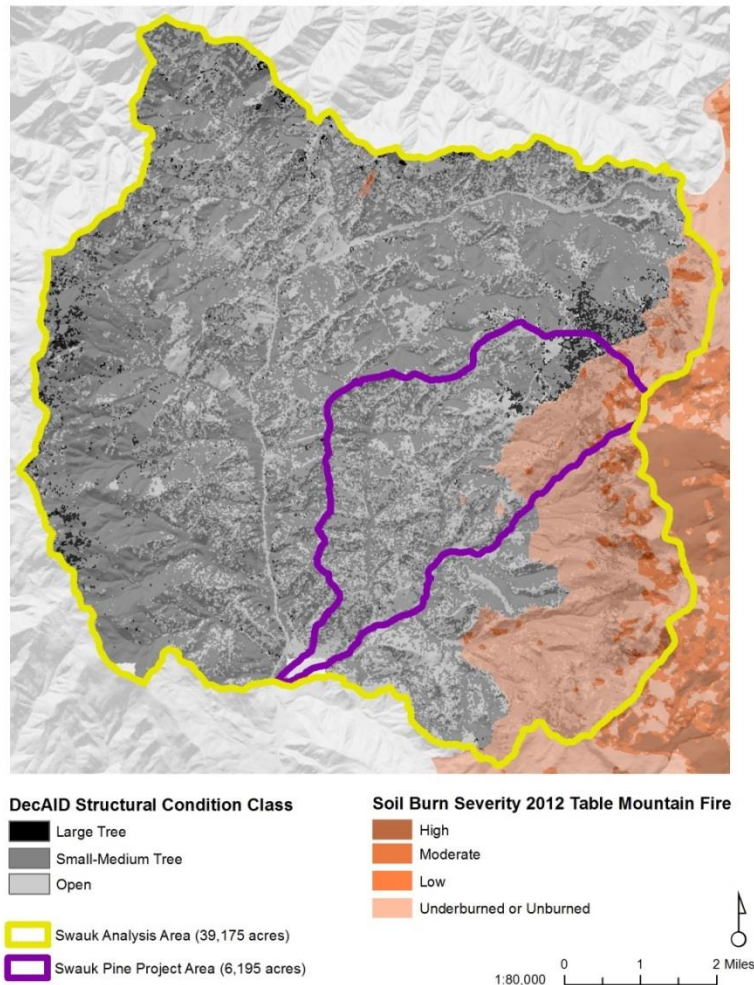


Fig. 28. DecAID Structural Condition Classes and 2012 fire soil burn severity in the Swauk Pine Analysis Area.

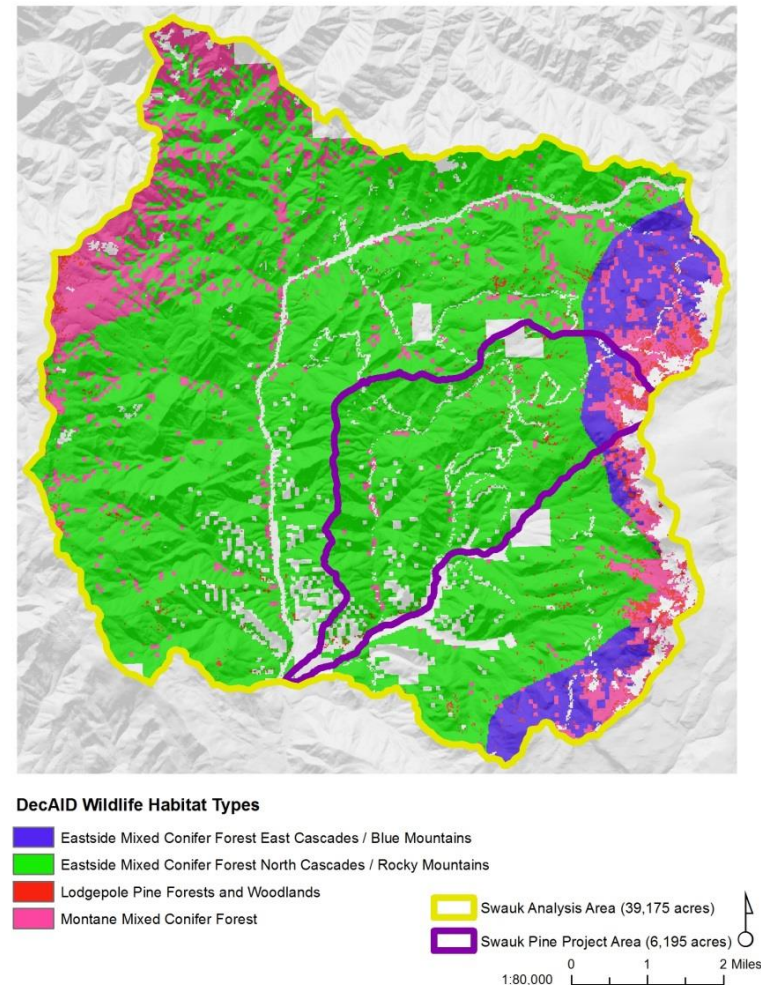


Fig. 29. DecAID Wildlife Habitat Types in the Swauk Pine Analysis Area.

Along most roads, there are also dispersed camping areas that are heavily used for most of the summer and fall, year after year. The amount of firewood that can be collected and burned in dispersed camping areas is limited only by a 2-week-stay limit, and after one occupant has moved on, another party often occupies the same site and continues to collect and consume firewood at that site. Therefore, snags and percent down wood cover are heavily depleted around heavily-used dispersed camping areas (personal observation, this writer). Research by Hollenbeck (2013) suggests a decline, on average, of 0.7 large snags ($\geq 20''$ dbh)/ha for every km of road. The Swauk Pine Project area has 7 miles of motorized route per square mile², suggesting an average decline of 1.1 large snags/acre from expected large snag densities. These activities have resulted in extremely low densities of large snags in the vicinity of roads and dispersed campsites—probably much lower than estimated from forest inventory data.

Current Levels of Wildlife Use

Meta-analysis of wildlife research in the Eastside Mixed Conifer Forest North Cascades / Rocky Mountains wildlife habitat type indicates that snag densities and percent down wood cover estimated from forest inventory data support dependent species at the 50% Tolerance Level⁴ (similar to reference conditions) (Figs. 30-33).

Observed mean snag density values on prey base study plots, however, are below 50% tolerance levels for 5 local species (Wildlife Specialist Report Table 7). Differences in scale and sampling effort confound the comparison of estimated and observed values, but based on the specific history of the Swauk Pine Project Area, it is reasonable to conclude that large snags and large logs are well below desired levels for the Swauk LSR and this project area.

Direct and Indirect Effects

Alternative 1 - No Action

In the absence of disturbance, both snag densities and percent down wood cover would continue to increase over short-, mid-, and long-term time periods, except along open roads, and in heavily-used dispersed camping areas. All open roads in the project area would remain subject to periodic danger tree management and firewood collection by campers, therefore snag and log densities along roads would remain low.

In drier stands, overstory canopies would grow denser due to growth of intermediate shade-tolerant grand fir trees. These trees would increasingly compete with older Douglas-fir and ponderosa pine trees, and the resulting stress could leave older trees more vulnerable to insect and disease attack. Mortality of dominant older trees would create valuable snags for wildlife, but if large numbers of older trees succumb at once, a locally adapted seed source may be lost. The growth of intermediate trees may also create new fuel ladders, exposing dominant older trees to injury or death by crown fire. The short-term benefit to wildlife from a new influx of large snags may be outweighed by loss of the best adapted seed sources for these drier sites.

⁴ Translation: 50% of published studies document use by a given species when snags densities or percent down wood cover occur at this level.

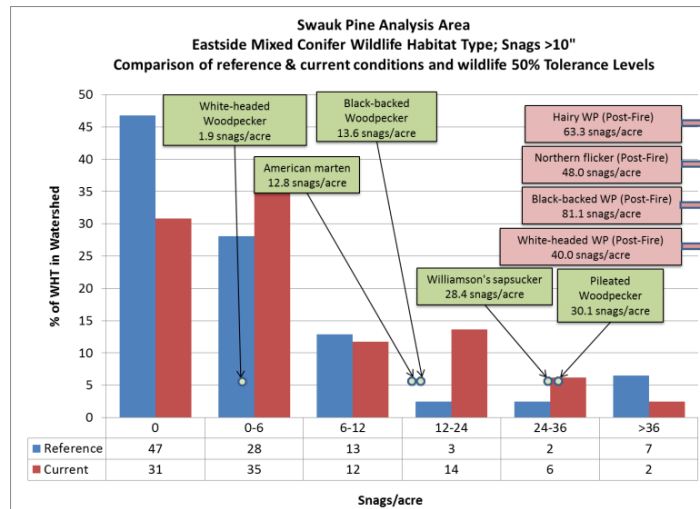


Fig. 30. DecAID distributional analysis of snags >10" dbh in the Swauk Pine Analysis Area.

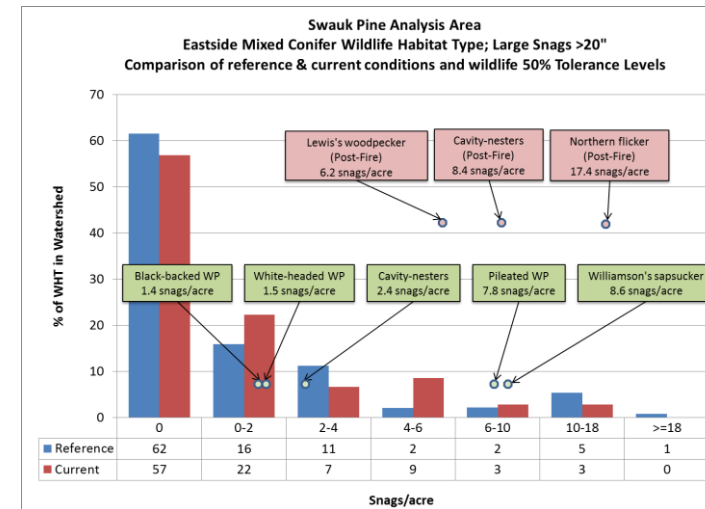


Fig. 32. DecAID distributional analysis of large snags >20" dbh in the Swauk Pine Analysis Area.

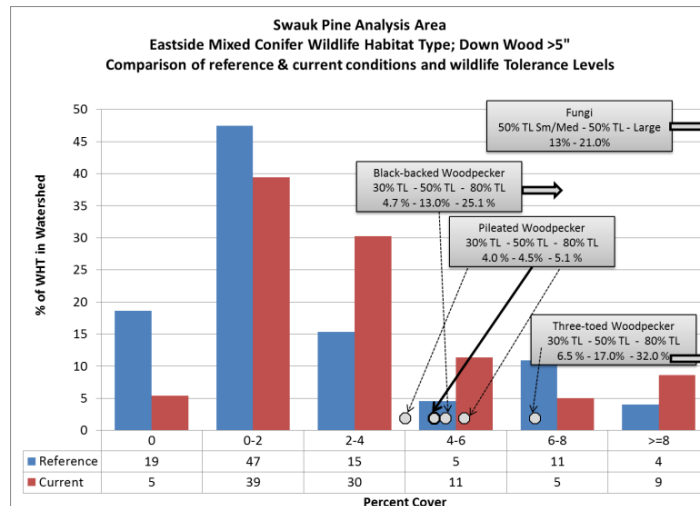


Fig. 31. DecAID distributional analysis of down wood > 5" in the Swauk Pine Analysis Area.

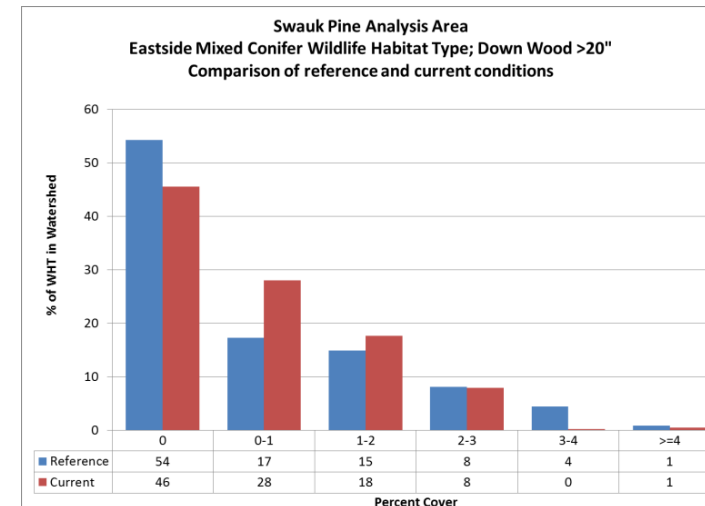


Fig. 33. DecAID distributional analysis of large down wood >20" in the Swauk Pine Analysis Area.

Table 3.17. Snag and log field data collected during the Swauk Pine northern spotted owl prey-base study entailing 234 plots among 12 northerly aspect units in the Swauk Pine Project Area, 2012.

	No. of snags or logs / Acre			
	All Snags	Snags > 11.8" dbh	All Logs	Logs > 11.8"
Mean	16.2	4.1	5.8	0.9
Standard Deviation	24.2	10.2	4.2	1.2

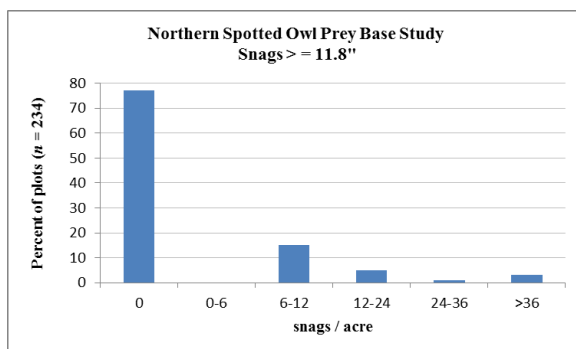


Fig. 34. Percent of plots in the northern spotted owl prey base study with varying densities of snags $\geq 11.8''$ dbh.

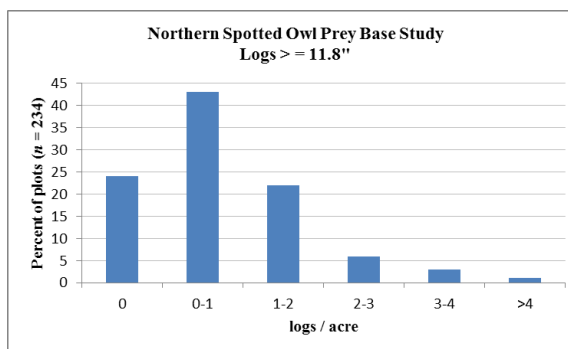


Fig. 35. Percent of plots in the northern spotted owl prey base study with varying densities of logs $\geq 11.8''$ dbh.

As canopy closures increase, the recruitment of large living ponderosa pine trees used by white-headed woodpeckers would decline. White-headed woodpeckers (not detected in 2 years of surveys) and northern flickers (known to be present) would decline as open canopies become dense. Pileated woodpeckers, however, may increase over the mid- and long-term, due to increased availability of dense late successional forest with large snags and large logs.

The risk of uncharacteristic wildfire would continue to increase as stands become denser and surface and ladder fuels accumulate within and between stands. A high-severity fire may create valuable snag structure for the nomadic black-backed woodpecker, but an uncharacteristically large stand-replacing fire may eliminate more snags and logs than it creates, along with much of the resident wildlife. It is impossible to predict when such an event may occur, or its intensity and size, but an uncharacteristic wildfire has the potential to negatively impact all wildlife populations that use decaying wood resources.

Alternative 2

Planned treatments would reduce snag densities in upland harvest areas, because some snags would need to be felled to provide for operator safety (Harrod et al. 2009). Snags and logs would be retained at current levels in unthinned skips in every harvest unit, and Riparian Reserves. Harvest prescriptions would be designed to meet desired snag retention levels for stands at levels that are within the historic ranges of

variability for these settings. Subsequent underburning would be designed to protect unthinned patches with snags from high intensity fire and to protect large diameter down wood from consumption.

Planned retention of large and old trees in and outside of unthinned patches would provide for future short-, mid-, and long-term snag recruitment in upland harvest areas. Moreover, large tree structure would develop more quickly in thinned stands—a potential benefit to such species as white-headed woodpecker (which in addition to snags, requires large old ponderosa pine trees for foraging in winter) and Williamson's sapsucker (uses large "hard" snags for nesting).

By design, harvest activities would not impact snag densities within Riparian Reserves, however, subsequent prescribed burning on the fringes of Riparian Reserves is likely to result in some torching and creation of new snags and/or snag patches. Therefore, snag and log densities within Riparian Reserves would increase in the short-term. New snags and especially snag patches would provide immediate new foraging opportunities for black-backed woodpeckers, and within a few years, such species as three-toed woodpecker and Williamson's sapsucker.

Burn plans would be designed to limit fire encroachment into inner gorge areas, preserving down wood structure and shade above water. Although suitability for pileated woodpecker would decline in upland harvest areas, other areas (inner gorges, most of the outer Riparian Reserve areas, and possibly some unthinned patches in harvest areas) would continue to support snag and log structure that may provide incidental foraging opportunities for pileated woodpeckers.

Prescribed burning in natural fuels areas would increase snag densities although burn plans would be designed to limit mortality to 15% or less of existing overstory trees, and to leave some areas completely unburned (Harrod et al. 2009). In areas with heavy fuel loads, however, burning may pose a risk of injury or death to desirable leave trees (large diameter trees, hollow trees, or trees with cavities). Retention of existing large snags is especially problematic, because those in advanced stages of decay are highly likely to be consumed by fire, and the proposed natural fuels underburn area is too large to find and protect every existing large tree or snag. The district would select specific areas to experiment with different methods for retaining desirable large trees and large snags, and would monitor the effectiveness of these methods. Possible methods for testing would include (but are not limited to) adjusting ignition strategies, lining, or raking fuels away from the bases of desirable leave trees.

Under both alternatives, plans to restore effective road closures would curb loss of snags resulting from illegal firewood cutting behind road barricades.

The combined effects of proposed harvest and burning most likely result in no net loss of snags across the project area over the short- and mid-term though average diameter would probably decrease (Harrod et al. 2009). Long-term effects would depend on successful repeated application of fire. Recruitment of large trees and large snags would rise to at least historic levels, in restored open forest, although total snag densities would decline from current levels.

Proposed treatments in the small-medium and open structural condition classes would create openings and accelerate growth of residual trees, moving this acreage into a large tree condition class over time. This shift would locally benefit woodpeckers associated with open forest with large trees, and large snags (white-headed woodpecker, Williamson's sapsucker) but would not affect wildlife populations or use of decayed wood elements at the landscape scale.

Cumulative Effects (Alternative 2)

Danger tree management and dispersed camping with associated firewood cutting have been and will continue to limit snags densities adjacent to open roads in the Swauk Pine Project Area. There are no other planned actions, however, that would in combination with Alternative 2, result in a cumulative effect on standing and down dead and defective trees in the project area.

Consistency Finding

Although 1990 Wenatchee Forest Plan standards for retention of snags are no longer considered adequate for maintaining viable populations of cavity excavators and all of the other wildlife that use dead and dying trees and logs, they remain in effect. Both alternatives would meet or exceed 1990 Forest Plan standards.

By design, treatments would also meet or exceed desired snag densities and percent down wood cover for late successional reserve. Denser forest cover and all large snags would be retained within Riparian Reserves. No trees would be removed from inner gorge areas except to supply large down wood for stream restoration activities. These provisions collectively ensure consistency with Northwest Forest Plan standards and guidelines for harvest activities in late-successional reserves.

Planned snag retention levels for dry, mesic, and moist forest settings are based on historic stand conditions known to support viable populations of snag- and log-dependent wildlife on a landscape scale; therefore, treatments under both alternatives would meet the viability requirements of the National Forest Management Act.

Old Forest Single-Story

Forest Service Sensitive Species: White-headed woodpecker (*Picoides albolarvatus*)

Introduction

There are no Forest Plan standards and guidelines specific to white-headed woodpecker (a Pacific Northwest Sensitive species); however, snag density requirements for the primary excavator group would include requirements for white-headed woodpeckers in old ponderosa pine forest. See previous section for standards and guidelines pertaining to Primary Cavity Excavators, and best available science regarding snag retention.

The Northwest Forest Plan established a large network of Late Successional Reserves, standards and guidelines for Riparian Reserves, and requirements for retention of snags, logs, and green trees in matrix. Based on these provisions, a large-scale viability assessment by the Scientific Analysis Team (SAT, Thomas et al. 1993) determined that white-headed woodpecker habitat would be of sufficient quality, distribution, and abundance to allow white-headed woodpecker populations to persist and remain well distributed within the planning area (National Forests within the range of the northern spotted owl). Subsequent monitoring indicates that late successional habitat trends across the Region are consistent with predictions based on the Northwest Forest Plan; therefore, projects that are consistent with amended Forest Plans are believed to support continued viability of this species (MIS Status Report page 59).

Existing Conditions

Population Status

The status of white headed woodpecker populations on the Cle Elum Ranger District is unknown. Sporadic sightings have occurred off the National Forest. Two years of pre-treatment white-headed woodpecker

play-back surveys in the Swauk Pine Project Area (24 stations visited 2 times in 2012 and in 2014) resulted in no detections. White-headed woodpecker use has been documented on adjacent districts, and at lower elevation forests outside the National Forest boundary in Kittitas County. They presumably used higher elevations areas of the National Forest here, prior to European settlement which experienced high-grade logging, and fire suppression in these areas. These activities have collectively resulted in widespread loss of open, old forest structure (including large old trees and large snags) in ponderosa pine cover types. Similar loss of habitat across the entire east slope of the Cascades has resulted in classification of the white-headed woodpecker as a “species of concern” in Bird Conservation Region 9 (USFWS 2008).

Ponderosa pine forest is considered a high priority habitat for conservation of birds on the east slopes of the Washington Cascades, and white-headed woodpecker is a “focal species” for this habitat type. The key habitat attribute for white headed woodpeckers is presence of large blocks of old ponderosa pine forest, with large old ponderosa pine trees and large snags (Altman 2000).

Habitat Conditions in the Project Area

Departure analysis for white-headed woodpecker habitat in the Swauk Pine analysis area indicated that certain statistics (percent land, large patch index, and minimum patch size) are within historic ranges of variation (HRV). Other statistics (patch density and edge density) are highly departed (well above HRV). The mean nearest neighbor statistic is highly departed (well below HRV), indicating the existing patches of habitat are too small and too close to each other.

Buchanan et al. (2003) reported that white-headed woodpecker nest sites have significantly more large trees and snags (primarily ponderosa pine) than random sites, and are most likely to occur on flatter slopes (<20%). In Oregon, other authors have reported that interspersed high and low canopy patches of ponderosa pine forest are important for white-headed woodpeckers—here these conditions would typically result from patchy, variable intensity wildfires. Nest sites also have a higher density of soft snags than random sites, indicating that in burned forests, retention of some unburned patches may be important for white-headed woodpeckers. Retaining at least 30% of the landscape with > 40% pre-fire canopy cover is recommended (MIS Status Report page 48-49).

Recent research on the Naches Ranger District found most white-headed woodpeckers selected home ranges (average 309 acres, $n = 19$) within forest patches that had undergone a recent disturbance; these included forests that had recently been burned with prescribed fire by the USFS (82%) or subject to disease (16%) (Lorenz et al. 2015). The authors suggest that recent forest disturbance, especially mixed-severity prescribed burns, may have been selected by white-headed woodpeckers because they created snags for nesting.

Direct and Indirect Effects

Alternative 1 - No Action

In the continued absence of disturbance, historically open forest structure on south slopes would continue to grow dense, and become increasingly unsuitable for white-headed woodpeckers. The risk of uncharacteristic wildfire would also continue to rise. See previous discussion under Primary Cavity Excavators above.

Alternative 2

Silvicultural treatments would maintain or restore open forest single story structure on 2,756 acres. Planned harvest and burning prescriptions would create highly favorable conditions for white-headed woodpeckers

over the short-, mid-, and long-term, including: open forest structure with large diameter trees, old trees, and snag retention at levels within the historic range of variability; variably spaced trees, including clumps, and presence of some denser forest patches containing large and soft snags, in an otherwise open forest setting. Denser cover would be associated with Riparian Reserves, complex unthinned patches within harvest areas, and unburned patches within the natural fuels prescribed burning area.

Cumulative Effects

The effects of previous timber harvest, dispersed recreation, and danger tree management on snag densities was described previously under the Primary Cavity Excavator Group. Continued snag removal associated with these activities would continue to limit snag densities along roads—removing potentially valuable nesting and foraging structure for white-headed woodpeckers. There are foreseeable planned actions that in combination with Alternative 2 would result in a cumulative effect to white-headed woodpeckers or their habitat.

Consistency Finding

Alternative 2 would restore suitable habitat structure for white-headed woodpeckers, on sites most likely to support this habitat. Snags would be retained at levels within the historic range of variability and known to support viable populations of white-headed woodpeckers at a landscape scale. These levels exceed snag retention standards under the Wenatchee Forest Plan (1990), and required snag retention levels for late-successional reserves, under the Northwest Forest Plan and Wenatchee Late-Successional Reserve Assessment. Alternative 2 is consistent with amended Forest Plan direction, but also use the best available science to ensure adequate retention of snags and continued viability of white-headed woodpeckers. It would not result in a downward trend towards federal listing of this R-6 Sensitive Species.

Riparian Forest

(MIS: Ruffed grouse; R6 Sensitive: peregrine falcon)

Regulatory Framework

There are no Wenatchee Forest Plan standards and guidelines specific to ruffed grouse, but forest-wide standards and guidelines for riparian areas would apply to this project (protect sensitive riparian features, e.g., lakes, ponds, and talus).

Existing Conditions for Ruffed Grouse

Ruffed grouse reside in the Project Area, based on many confirmed sightings. Peregrine falcons have been observed here during fall migration, and may use the area for breeding though no nests have been located.

Population Status

With 276,000 acres of well-distributed habitat, rugged grouse habitat is considered abundant on this National Forest. Habitat loss is considered the greatest risk factor facing local populations (MIS Status Report page 34).

Ruffed grouse are managed by WDFW as small game species; however, population trend is not monitored. Both the number of grouse hunters and number of grouse harvested have declined by 1/3 since the late 1960s (WDFW 2008). They are not a species of Regional Concern in BCR 9, although the population trend

is characterized as highly variable or uncertain (from Partners in Flight [PIF] database, <http://www.rmbo.org/pif/scores/scores.html>)

Based on abundance and broad distribution of habitat, there is no viability concern for ruffed grouse on this Forest (MIS Status Report page 36), although rapidly increasing introduced non-native wild turkey may occupy the same niche. Forest Plan standards and guidelines provide for continued viability of this species across the forest planning area.

Habitat Conditions

Ruffed grouse are associated with the mixed coniferous and deciduous forest structure typically found in riparian areas, and with early successional deciduous habitats (particularly aspen) at low to moderate elevations. They nest on the ground near cover provided by trees, stumps, logs, shrubs and rocks. Large logs with overhanging cover are used for territorial drumming. Their diet includes insects, seeds, berries, nuts, tree buds, blossoms, and herbaceous plants, and occasionally small amphibians—all readily available in and around healthy streamside vegetation. Dense understory shrubs and ground cover are important for their persistence in summer (providing protection for broods from predators as well as diverse foraging opportunities). Dense conifer foliage may provide protection from predators and the elements in winter (USFS Wenatchee National Forest 1999, unpublished report).

The diversity of vegetation in riparian areas and along streams also supports abundant avian prey for peregrine falcons, which have been observed in the Swauk Pine Analysis area during summer and fall migration. There is nesting habitat (cliff structure) for peregrine falcon in and near the Swauk Pine Project Area. Proposed treatments may indirectly impact peregrine falcons through effects on avian prey.

About 13% of the Swauk Pine Project Area and 15% of the Swauk Pine Analysis Area is located within Riparian Reserves, as mapped with default buffer widths listed in the Northwest Forest Plan (ROD 1994 page C-30).

Effects from Past and Present Management Actions:

Many riparian stands in the project area have been partially harvested in the past. In places, roads have also affected riparian forest habitats with 9% of the Riparian Reserves within the Swauk Pine Analysis Area and 14% of Riparian Reserves with the Swauk Pine Project Area located within the 60 meter zone of influence for open roads and subject to recreational firewood removal and/or hazard tree management. This value is characterized as a low level (<30%) of human influence on riparian habitats on the Okanogan-Wenatchee National Forest (Gaines et al. 2003, page 25), however, it does not reflect the effects of roads on intermittent streams. The actual figure would be somewhat larger, but still in the low-to-moderate range relative to the rest of this Forest.

In the past, domestic sheep-grazing created some degraded riparian conditions within the Swauk Pine Analysis Area. In recent year, the Cle Elum Ranger District imposed a 2-day stay limit for bedding grounds, and instituted a requirement for bedding grounds to be located outside of Riparian Reserves. These actions—and closely monitored utilization levels—have reduced impacts to riparian vegetation. Although impacts to riparian vegetation from grazing generally do not persist beyond the current season, the upland and riparian areas that are grazed by sheep would provide little or no vegetative cover for ruffed grouse broods for the remainder of the growing season. Grouse are probably displaced from grazed over areas in late summer and fall.

Direct and Indirect Effects

Alternative 1

Riparian forests would continue to provide the mix of coniferous and deciduous vegetation and down wood structure that supports ruffed grouse and an avian prey base for nesting or migrating peregrine falcons. The risk of uncharacteristic wildfire, however, would continue to increase across the landscape, and if and when such a wildfire event occurs, the denser, fuel-laden structure of riparian areas may result in high fire severity and widespread loss of over-story canopy, down logs, deciduous shrubs and other understory vegetation used by ruffed grouse and other birds. Conversely, a low or moderate severity fire may create smaller openings within riparian forest, stimulating shrub growth and increasing percent down wood cover. Smaller, limited disturbance would enhance vegetative diversity and improve foraging opportunities for grouse and other birds. This would indirectly increase incidental foraging opportunities for peregrine falcons.

Alternative 2

Treatments would treat 60% of the Riparian Reserve acreage in the Project area (498 of 828 acres). Treatments in riparian reserve include 32 ac of commercial harvest and underburn, 181 ac of large wood replenishment, and 285 acres of natural fuels underburn. These figures include inner gorges, which would be excluded from all harvest, and would not be intentionally ignited during prescribed burns. Burning prescription would be designed to protect inner gorge areas from high intensity fire, and to effect only patchy low intensity underburning elsewhere in the Reserves, leaving a high percentage of the Reserve unburned. Where harvest areas overlap the Reserves, riparian overstory canopy requirements would limit harvest intensity and preserve snags. Therefore, riparian reserves would continue to support dense forest cover—albeit slightly more variable due to the effects of limited low intensity burning and harvest.

With patchy, mostly low intensity burning and limited torching within Riparian Reserves, proposed treatments may benefit ruffed grouse and the avian prey of peregrine falcon, by increasing the diversity of understory vegetation, and stimulating growth of shrubs and forbs. Snag densities would also remain high (mitigation for reduced snag densities in upland harvest areas). Even with improved conditions within Riparian Reserves, however, ruffed grouse use of the Project Area may actually decline because they are not confined to Riparian Reserves, and treatments would remove some protective vegetation and down wood cover in adjacent upland forest. Small unthinned patches in upland harvest areas may receive incidental use.

If an active peregrine falcon aerie (nest) is located in the Project Area, a seasonal operating restriction March 1st - June 30th will be implemented (no operation of chainsaws or heavy equipment and no burning within 2,620' of the nest between March 1st and June 30th (Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) 2005).

Cumulative Effects for Alternative 2

Effects of the existing road network and associated human activities on Riparian Reserves are reflected in the 14% riparian non-winter habitat influence index, described previously. Firewood removal along roads and around dispersed camping areas would continue to impact Riparian Reserves, reducing overstory cover and percent down wood cover. Domestic sheep-grazing would also continue to impact Riparian Reserves, although utilization standards should prevent long-term impacts to vegetation and site capability. There

are no foreseeable future actions that in combination with Alternative 2 would result in a cumulative effect to riparian vegetation or riparian-dependent wildlife.

Consistency Finding

Alternative 2 treatments would accelerate the recruitment of large trees, snags, and logs within Riparian Reserve, enhancing their ability to support well-distributed populations of wildlife that use this structure (ACS Objective No. 9). Any trees felled for safety reasons would be retained on-site (as required under RA-2), and the selection and application of herbicides in Riparian Reserves would follow regional direction established by the 2005 Invasives ROD (as required under RA-3). See separate discussion on the effects of herbicide use on wildlife at the end of the wildlife section.

Old Multi-Story Forest

MIS: American marten, three-toed woodpecker, pileated woodpecker, and northern spotted owl (Threatened); R6 Sensitive Species: Pacific fisher (Proposed)

Regulatory Framework

The Northwest Forest Plan's region-wide network of Late Successional Reserves, Riparian Reserves, and provisions for retention of green trees, snags, and down wood were designed to support stable and well distributed populations of all wildlife associated with dense old forest, across the range of the northern spotted owl.

The Final Revised Recovery Plan for the Northern Spotted Owl (Recovery Plan) (USFWS 2011) informed design of the Swauk Pine Project. The Recovery Plan includes four basic steps: 1. completion of a range-wide habitat modeling tool; 2. habitat conservation and active forest restoration; 3. barred owl management; and 4. research and monitoring. The Swauk Pine Restoration Project aligns fully with Step 2. A separate barred owl removal experiment encompassing the Swauk Pine Project Area is underway, and aligns with Step 3. The proposed northern spotted owl prey-base study would examine the effects of treatments on prey habitat, in alignment with Step 4.

Scale of Analysis

Effects on spotted owls were assessed at analysis and project area scales, and for the breeding and home range areas of affected owls. Habitat class was assessed using aerial photo interpretation (2014 imagery). Dense late successional habitat for Pacific marten, three-toed woodpecker, pileated woodpecker, and Pacific fisher was assessed for the Swauk Pine Project Area.

Existing conditions

Local Occurrence

Spotted Owls: There is one occupied northern spotted owl site in the Project Area. The surrounding Nesting Roosting Foraging (NRF) habitat is a dry forest type with a high ratio of ponderosa pine. This habitat is configured as narrow stringers on north aspects in highly varied terrain, and as small patches of dense forest in sheltered draws (low quality habitat).

Pacific Marten: Munzing and Gaines (2008) monitored Pacific marten abundance within dry and moist late-successional forest habitats on the Cle Elum and Wenatchee River Ranger Districts. They did not detect any marten in two years of sampling within late-successional dry forests. Their results corroborate

those of Bull et al. (2005) indicating that conservation efforts for Pacific marten should focus on mesic and moist forest, not dry forest habitats.

Three-toed woodpecker: There is one documented sightings of three-toed woodpecker in the analysis area. They potentially use denser stands in cool mesic and moist settings and likely use 1,210 acres of recently burned high-elevation forest on the eastern fringes of the Project Area.

Pileated Woodpecker: There is ample sign of pileated woodpecker use in the Project Area.

Pacific Fisher: There are no confirmed sightings of Pacific Fisher in the Project Area, or the Swauk Pine Analysis Area. Numerous surveys for Pacific marten in watersheds to the west have not detected fisher, and they WDFW report that fisher had been extirpated from the State by the mid-1900s. A reintroduction effort of Pacific fisher to the Cascades led by the National Park Service and Washington Department of Fish and Wildlife is underway near Mount Rainier National Park.

Status of Populations

Northern Spotted Owl: Population levels are affected by multiple factors; suitable habitat availability, meteorological conditions, and competition with barred owls have been identified as main the influences on spotted owl populations. Dugger et al. (2016) found that the observed variation in recruitment rates across the range of the northern spotted owl was best explained by an interaction between total winter precipitation and mean minimum winter temperature. Barred owl presence was associated with increased local extinction rates of northern spotted owl pairs and a greater amount of suitable habitat was generally associated with decreased extinction rates.

The Cle Elum northern spotted owl demography study area overlaps the Swauk Pine Project Area and provides demographic information going back to 1989 and population growth-rate estimates to 1992. The Cle Elum population is very low with an annual population trajectory of -8.4% (Dugger et al. 2016) (Fig. 36). Across the range of the northern spotted owl the population trajectory is -3.8% per year (Dugger et al. 2016) (Fig. 37).

A study examining the response of northern spotted owl prey species densities to different canopy closure percentages as a result of forest restoration treatments is ongoing in the Swauk Pine Project Area (Fig. 38). Two years of pre-treatment data have been collected in the project area. Data from two other replicate study areas in the eastern Oregon Cascades will be included in the final post-treatment analysis.

A study examining if the experimental removal of barred owls improves population trends of northern spotted owls is underway in the Swauk Pine Project Area. If the results of the study are positive, land managers will know if barred owls can be effectively managed to benefit recovery of northern spotted owls. Five barred owls have been removed from the Swauk Pine Project Area to-date (Fig. 22).

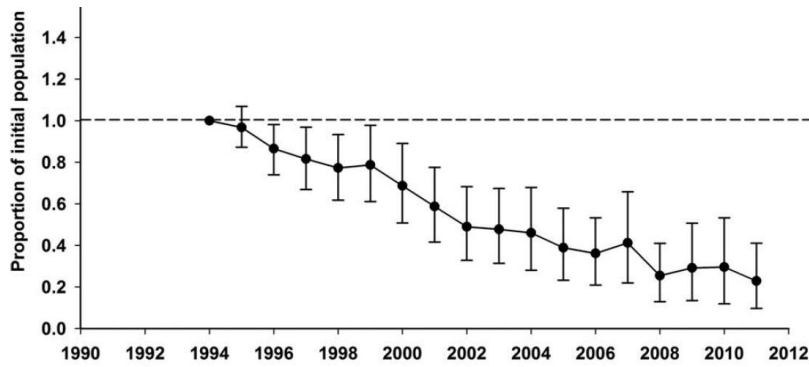


Fig. 36. Annual estimate of realized population change with 95% confidence intervals for northern spotted owls in the Cle Elum study area.

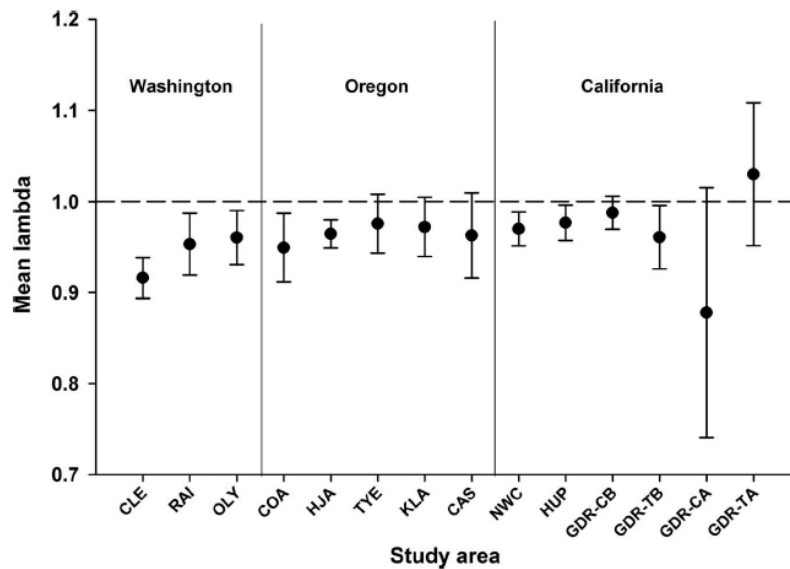


Fig. 37. Northern spotted owl population trends, 1985-2014 (from Dugger et al. 2016). CLE = Cle Elum study area (annual population change -8.4%). GDR-CA = control area in California for a subset of the barred owl removal study (annual population change -12.2%), GDR-TA = corresponding California treatment area with barred owl removal (annual population change +3.0%).

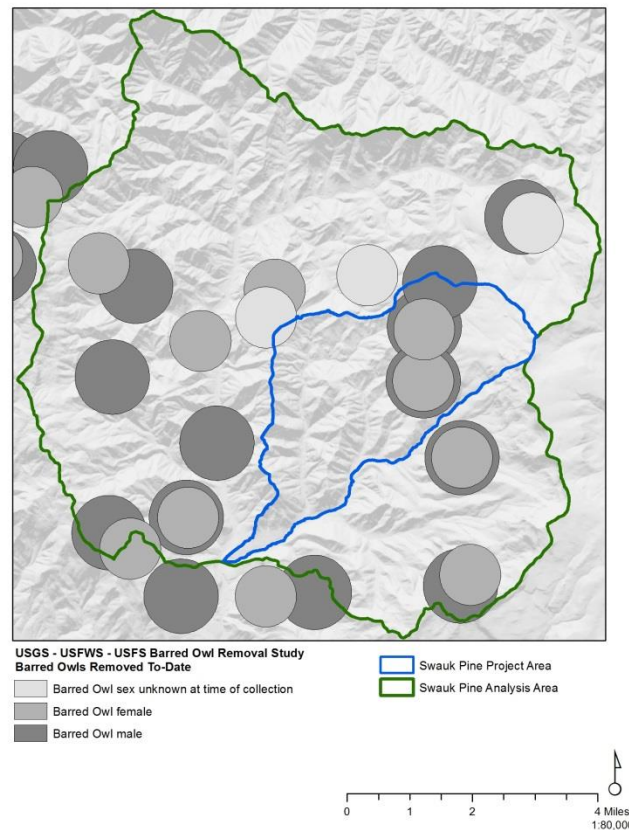


Figure 38. Barred owls removed since January 2016 in the Swauk Pine Analysis and Project Area. Locations are buffered to the average home range size of barred owls in the Eastern Cascades (Singleton 2010 et al. 2010).

Pacific Marten: Source habitat for Pacific marten includes cold moist and cold dry forests with multi-layered stand structure, large trees, and closed canopies (more than 50%). These conditions are widely distributed across the Forest, but also broadly dispersed and nearly absent from the Swauk Pine Project Area. Populations and habitat have declined from historic levels. The viability outcome is category B/C, (populations and habitat are widely distributed, but highly dispersed with some areas exhibiting lower abundance). With updated information from current studies the viability outcome may change to category C (suitable habitat is broadly distributed, but risk factors are limiting habitat occupancy and demographic performance). Risk factors for marten include timber harvest, fuels management, and transportation route human disturbance. Washington Cascades Pacific marten populations north and south of the Snoqualmie Pass vicinity may be genetically isolated by past forest management and the Interstate 90 corridor. Moriarty et al. (2015) found Pacific marten were 1,282 times less likely to be detected in openings (natural or managed areas with little or no overstory canopy cover) than complex stands.

Three-toed Woodpecker: One three-toed woodpecker was detected out of 2,712 bird detections during the Swauk Pine remote audio recording breeding bird survey, 2015. Woodpeckers are expected to have a low detection rate with passive survey methods. Forest-wide habitat modeling of source habitat for three-toed

woodpecker (old forest in subalpine or montane forests; with abundant moderate to large snags in early stages of decay; recent post-fire habitats may be particularly important), resulted in a viability outcome of “B/C” across the Forest (populations and habitat are widely distributed, but highly dispersed with some areas exhibiting lower abundance). It is not a species of regional concern in BCR 9, but is listed as vulnerable in Washington State. Forest Plan standards and guidelines would provide for continued viability of this species, across the planning area.

Pileated Woodpecker: Forest-wide habitat modeling of source habitat for pileated woodpeckers (late seral forests with closed canopies and large snags >40cm dbh, also younger forests with scattered large snags) indicates that habitat has declined from historic levels over most of the Okanogan-Wenatchee National Forest. Populations have presumably declined as well and are not as well distributed as they were in the past. Risk factors include loss of large trees, snags, and logs in source habitat due to timber harvest and road-related factors. The viability outcome across the Forest is Category C (the species is well distributed on a portion of the planning area). In spite of these declines, Forest Plan standards and guidelines are expected to provide for viability of pileated woodpeckers across the planning area.

Pacific Fisher: Fisher is classified as endangered by the state of Washington. The U.S Fish and Wildlife Service is proposing to list as threatened the West Coast distinct population segment of fisher under the Endangered Species Act (ESA). Critical habitat is not being proposed at this time. Pacific fisher is listed as a Sensitive Species by the Pacific Northwest Regional Forester. No fisher detections are known from the Cle Elum Ranger District in more than 60 years.

A Pacific fisher reintroduction effort is underway in Washington State (Aubry and Lewis 2003). Effects of the Action Alternative on this species are based on effects to potential fisher habitat, on the premise that a Conservation Strategy is forthcoming, and that it would encompass all areas historically occupied by fisher. A Conservation Assessment (with a synthesis of published science) was published in 2010 (in advance of a Conservation Strategy) and provides the basis for this analysis.

Habitat Conditions

Northern Spotted Owl: The breeding and home-range areas for 2 known spotted owls (site nos. 334 and 312) overlap portions of the Swauk Pine Project Area (Table 8 & 9 below). Desired Future Condition totals reflect projected habitat development inside the Project Area but do not reflect future habitat development outside the Project Area. Assuming a comparable strategy for protection of known owl sites outside the Project Area, then available habitat for site 312 would likely rise above the incidental take threshold, over time.

Pacific Marten: There is very little suitable Pacific marten habitat in the Swauk Pine Project Area.

Three-toed Woodpecker: There is potential habitat for three-toed woodpeckers in the upper elevations of the Project Area in the Potential Wilderness Area where large structural condition class forest exists. The 2012 Table Mountain fire extending from the eastern edge of the Project Area provides 1,210 acres of source habitat for three-toed woodpeckers in the Swauk Pine Project Area.

Pileated Woodpecker: Pileated woodpeckers have benefited from the current spruce-budworm activity in the Swauk Pine Project Area. Recent Douglas and grand fir snag recruitment is high, which provides ample wood-boring beetle larva for woodpeckers.

Table 8. Effects of treatments on two northern spotted owl breeding circles in the Swauk Pine Project Area.				
			Affected Owl Breeding Circle	
			312	334
			Acres	
Baseline Condition	Nesting-Roosting-Foraging		467	433
	Dispersal		468	299
Baseline Condition in Project Area	Nesting-Roosting-Foraging		12	318
	Dispersal		56	191
Effects from Treatments	Nesting-Roosting-Foraging	Degraded	0	22
		Downgraded to Dispersal	10	6
		Removed	0	13
	Dispersal	Degraded	30	41
		Removed	0	55
	Post-Project	Nesting-Roosting-Foraging		457
Dispersal		478	250	
Treatments Result in Incidental Take			Yes	Yes
Desired Future Condition	Nesting-Roosting-Foraging		483	574
	Dispersal		522	466

Table 9. Effects of treatments on two northern spotted owl home-range circles in the Swauk Pine Project Area.				
			Affected Owl Home-Range Circle	
			312	334
			Acres	
Baseline Condition	Nesting-Roosting-Foraging		2,632	2,878
	Dispersal		2,295	1,903
Baseline Condition in Project Area	Nesting-Roosting-Foraging		499	1,027
	Dispersal		424	726
Effects from Treatments	Nesting-Roosting-Foraging	Degraded	134	421
		Downgraded to Dispersal	28	1
		Removed	74	237
	Dispersal	Degraded	132	244
		Removed	179	341
	Post-Project	Nesting-Roosting-Foraging		2,530
Dispersal		2,143	1,563	
Treatments Result in Incidental Take			Yes	Yes
Desired Future Condition	Nesting-Roosting-Foraging		3,027	3,207
	Dispersal		2,610	2,206

Pacific Fisher: Fishers were known to use a variety of low and mid-elevation forested plant communities across their historic ranges, but are generally associated with moderate to dense forest canopy, often contiguous canopy, with abundant large trees, snags, and logs, and complex stand structure. Large trees with cavities are essential for denning, and along with large snags and large logs provide resting and foraging opportunities. In the Swauk Pine Project Area, this type of structure occurs as remnant structure or small inclusions in younger and/or moderate canopy stands and as with Pacific marten conservation efforts for Pacific fisher should focus on mesic and moist forest, not dry forest habitats.

Direct and Indirect Effects

Alternative 1 - No Action

In the absence of disturbance, stand structure in dense stands would become increasingly complex, with continued development of intermediate strata (shade-tolerant grand fir), recruitment of snags in all strata, and increased accumulation of logs on the forest floor. Diameter growth in overstory trees would slow, due to increased competition with intermediate trees, therefore, recruitment of large trees, snags, and logs would slow. Recruitment of decadent snags and logs and defective trees would rise. Over time, as overstory trees die and create gaps in the canopy, a new cohort of shade tolerant trees may become established in the understory. All of these processes would create cover and foraging substrates for small mammals and birds, and improve foraging opportunities for northern spotted owl, Pacific marten, and Pacific fisher. Increasing numbers of snags—including some large snags—would improve habitat suitability for pileated woodpecker and three-toed woodpeckers over time.

The risk of uncharacteristic disturbance (wildfire and/or large-scale insect and disease outbreaks), however, would continue to rise across the landscape, due to increased accumulation of surface and ladder fuels within and between stands, and increased stress on trees due to competition. When a fire comes, dense stands have always been likely to burn with high fire severity, but the extent of the next high severity fire may be much larger than what would have occurred historically, due to the departed landscape condition. All of the dense late successional habitat would be at increased risk to fire.

Alternative 2 - Revised Proposed Action

Effects to Habitat

Occupied northern spotted owl habitat would be adversely affected in the short-term (Table 8 and 9). The total amount of NRF habitat within the project planning area would decline in the short-term and increase in the long-term under Alternative 2 (Table 10).

Table 10. Effects of treatments on northern spotted owl habitat in the Swauk Pine Project Area.			
			Acres
Baseline Condition in Project Area	Nesting-Roosting-Foraging		1,617
	Dispersal		1,664
Effects from Treatments	Nesting-Roosting-Foraging	Degraded	485
		Downgraded to Dispersal	271
		Removed	427
	Dispersal	Degraded	705
		Removed	524
Post-Project	Nesting-Roosting-Foraging		919
	Dispersal		1,411
Desired Future Condition	Nesting-Roosting-Foraging		1,906
	Dispersal		1,276

Treatments would result in short-term adverse effects to spotted owls and to critical habitat for spotted owls, but most of the impact would be from removal of young multi-storied forest on dry sites—areas that provide low quality owl habitat but offer strategic fuel reduction benefits following the recommendations of Gaines

et al. (2010). Short-term adverse effects include a reduction in dwarf mistletoe structure (Hessburg et al. 2008) and a reduction in large snags (Harrod et al. 2009) which negatively affect important spotted owl prey species (northern flying squirrel and bushy-tailed woodrat) (Lehmkuhl et al. 2006a and 2006b). A small amount of owl habitat (~19 acres) would be downgraded for experimental prey-base treatments (consistent with the intent of the Swauk Late-Successional Review Assessment).

In the long-term, larger contiguous patches of high quality spotted owl habitat containing primary constituent elements (the physical and biological features of critical habitat essential to a species' conservation) would be established in multiple, sustainable locations, and surrounded by open forest that reduces risk of fire spread into and out of each patch. The landscape's overall resilience to disturbance would improve, therefore, the Swauk Pine Project is beneficial to spotted owls and to critical habitat for spotted owls, in the long-term.

Effects from Disturbance:

Proposed harvest and burning operations would generate noise above ambient forest conditions (as well as smoke and heat) that would pose a disturbance to wildlife. Such disturbance would result in temporary displacement of any martens and birds that happen to be using the area. Due to the marginal suitability of this area for marten, three-toed woodpecker, and pileated woodpecker, however, the animals displaced would be those that are using the area on incidental basis; therefore displacement would have little or no lasting effect on the affected animals. There would be little or no effect on source habitat outside of the Project Area, or populations using the Swauk Analysis Area.

The risk of disturbance to known spotted owls would be reduced by required mitigations (seasonal operating restrictions) that minimize incidental take.

If a northern goshawk nest is encountered during implementation WDFW management recommendations will be followed (WDFW 2004)

Cumulative Effects (Alternative 2)

The planned 4-year experimental barred owl removal study is likely to have a short-term beneficial effect on local spotted owl occupancy. There are no foreseeable planned actions that in combination with alternative 2 would change the influence of roads and or alter dense late successional habitat structure, resulting in a cumulative effect to dense old forest habitat.

Consistency Finding and Determinations of Effect

The Revised Spotted Owl Recovery Plan recommends that dynamic, disturbance-prone forests of the eastern Cascades be actively managed in a way that reconciles the overlapping goals of spotted owl conservation, response to climate change, and restoration of dry forest ecological structure, composition and process (USFWS 2011). Based on preliminary discussions with U.S. Fish and Wildlife Service, Alternative 2 aligns with these objectives, and is consistent with the Recovery Plan. Due to expected habitat removal, however, the determination of effect for spotted owl and for spotted owl critical habitat is still "likely to adversely affect".

Level 1 discussion with USFWS has been initiated and formal section 7 consultation will soon follow. Results of consultation will be incorporated into the Final Environmental Analysis and draft decision for this project.

Alternative 2 is consistent with the standards and guidelines of the Wenatchee Forest Plan as amended by the Northwest Forest Plan, which provides for continued viability of marten, three-toed woodpecker, and pileated woodpecker across the Forest planning area.

The Swauk Pine Project Area may one day provide incidental foraging opportunities for fisher. Because fisher are believed to be extirpated from the state of Washington (except for reintroduced populations in the Olympic Peninsula and south Cascades), there would be no population level impacts from this project. The Action Alternative would not result in a downward population trend that would lead to federal listing under the Endangered Species Act.

Wide-ranging Carnivore Group: Grizzly Bear, Gray Wolf, and Wolverine

Introduction

All three wide-ranging carnivores could potentially use or visit the Swauk Pine Analysis Area, due to abundance of preferred prey (deer and elk) and also herbaceous forage that may be attractive to grizzly bears. Effects from treatments would stem largely from impacts on herbaceous forage (affecting both grizzly bears and ungulate prey), and from short-term disturbances that reduce predaceous foraging opportunities.

Regulatory Framework

Gray wolves in the Swauk Pine Analysis Area are federally listed as an endangered species. There is a State recovery plan for wolves in Washington. Interim forest direction requires protection of occupied den and rendezvous sites.

Grizzly bears are federally listed as a threatened species. The project area is located on the Southeastern edge of the North Cascades Grizzly Bear Recovery Zone, in the Swauk Bear Management Unit. There can be no net loss of core area for grizzly bears under the North Cascades Grizzly Bear Recovery Plan -

Wolverines are listed as Sensitive Species in Region 6. There is no conservation strategy yet for wolverine. A three state (Montana, Idaho, Washington) effort began this year to systematically survey the wolverine's range. At this time, Forest Service actions cannot not result in significant downward population trends that would lead to federal listing of wolverine (FSM 2670).

Existing Conditions

Local Occurrence

There have been no reports of grizzly bears in or near the Project Area or the larger analysis area. The Teanaway wolf pack utilizes the western half of the Swauk Pine Analysis Area but does not seem to use the Project Area (personal communication with on-going Washington State University wolf – livestock interaction study graduate student). A young male wolf dispersed from the Teanaway Pack in 2012 and was killed by a cougar south of the Analysis Area. Wolverines occur to the northwest of the Analysis Area and an unconfirmed report from Mission Ridge Ski Area east of the Analysis area was received in 2015.

Population Status

Current populations for all three wide-ranging carnivores are too low to be effectively monitored (Gaines et al. 2003). The North Cascades Grizzly Bear Recovery Plan – North Cascades Subchapter (USFWS 1997) provides for recovery of the North Cascades grizzly bear population. The state recovery plan provides for

long-term viability of gray wolves. Until a Conservation Strategy is devised, the long-term viability of wolverine is addressed by ensuring that Forest Service actions do not result in significant downward trends in population.

Habitat Conditions

All three wide-ranging carnivores may be attracted to this area in spring and early summer, due to abundant elk, deer, and small mammal prey populations. By mid-summer and into fall, however, human disturbance is high and ungulate prey are more dispersed; therefore, use of the area by wolverine, grizzly bears, and gray wolves is likely to be incidental, at best. They potentially use the entire Project Area.

Wolverines are opportunistic feeders that take a wide variety of prey in summer and primarily scavenge on large mammal carrion in winter. Snow-covered talus slopes, boulder fields, tree roots, and log jams may be used as natal den sites—usually at much higher elevations than found in the Swauk Pine Project Area (Bianci 1994, pp. 111-113). There is no denning habitat for wolverine in this Project Area. Late-spring snow cover is the most useful predictor of wolverine occurrence. There is little wolverine habitat (late-spring snow cover) in the project area and it is isolated from more contiguous habitat to the west (Copeland et al. 2010).

Grizzly bears use a wide variety of habitats in pursuit of preferred herbaceous food resources, berries, carrion, and live prey (small mammals and ungulates). Current early season core equals 28% (Fig. 39), current mid and late season core equals 5% (Fig. 40) in the Project Analysis Area (Gaines 2003). A relative rating < 55 percent core area indicates a high level of human influence from high use trails and roads.

Gray wolves prey primarily on deer and elk of which are abundant in the Project Area. Road densities at which use is less than expected for gray wolves range from 0.4 to 0.7 kilometers per square kilometer (Gaines 2003). Current motorized route densities in the Project Area are 3.73 kilometers per square kilometer.

Direct and Indirect Effects

Alternative 1 - No Action

As more of the forested landscape becomes dense in the absence of disturbance, deer and elk abundance is likely to decline, along with predaceous foraging opportunities for wide-ranging carnivores. Human disturbance associated with motorized traffic on trails and roads, and all forms of dispersed recreation would remain high, and would probably continue to limit wide-ranging carnivore use to incidental levels.

Risk of uncharacteristic fire would continue to increase due to increased density of trees and increased continuity of surface and ladder fuels across the landscape. A large, high severity fire could reduce deer and elk use of the project area for 10-20 years, but a variable intensity fire could increase herbaceous forage for prey (as well as grizzly bears), and indirectly improve foraging opportunities for all of the wide-ranging carnivore species.

Alternative 2 – Revised Proposed Action

Effects to Habitat

Alternative 2 would create new herbaceous foraging areas for ungulate prey while maintaining high quality cover for prey species. See previous discussions of effects of the alternatives on deer and elk. The associated change in predaceous foraging opportunities for wide-ranging carnivores would not be discernible at a landscape scale.

Planned construction and use of temporary roads under alternatives 2 would temporarily reduce security habitat for up to 5 years. Construction and use of these roads may result in brief and localized displacement of any wide-ranging carnivores that may be present (as well as their prey), slightly reducing predaceous foraging opportunities for wide-ranging carnivores. The loss would be inconsequential for affected animals, and would not affect carnivore population levels.

Even though it would not increase security habitat, all wide-ranging carnivores would benefit from reduced disturbance associated with planned road closures.

Effects from Disturbance

Under alternatives 2 and 3, operation of chainsaws and heavy equipment in mechanical thinning areas and operation of helicopters, engines, and portable pumps in association with burning would result in noise above ambient conditions and disturbance to wildlife, including wide-ranging carnivores and their prey. Affected animals would be temporarily displaced from these areas. Only a small number of animals would be affected, however, and there would no effect on carnivore populations.

Cumulative Effects

Effects from existing travel routes on habitat for wide-ranging carnivores are already reflected in road density class and core area indices reported above. There are no foreseeable planned actions that in combination with alternative 2, would result in a cumulative effect to grizzly bear, gray wolf, or wolverine core area or security habitat.

Consistency Finding

Based on expected temporary loss of predaceous foraging opportunity resulting from noise disturbance during thinning and burning operations, Alternative 2 may affect but would not likely adversely affect grizzly bear and gray wolf, and may impact but would not likely adversely impact wolverine. Any affected grizzly bears, gray wolves and wolverines would be using the Project Area on an incidental basis, due to high levels of human disturbance associated with roads.

Alternative 2 would not result in a net loss of core area for grizzly bears within the North Cascades Grizzly Bear Recovery Zone. Nor would it increase core area. Alternative 2 is consistent with the North Cascades Grizzly Bear Recovery Plan – North Cascades Chapter, designed to ensure delisting, and ultimately the long-term viability of this species.

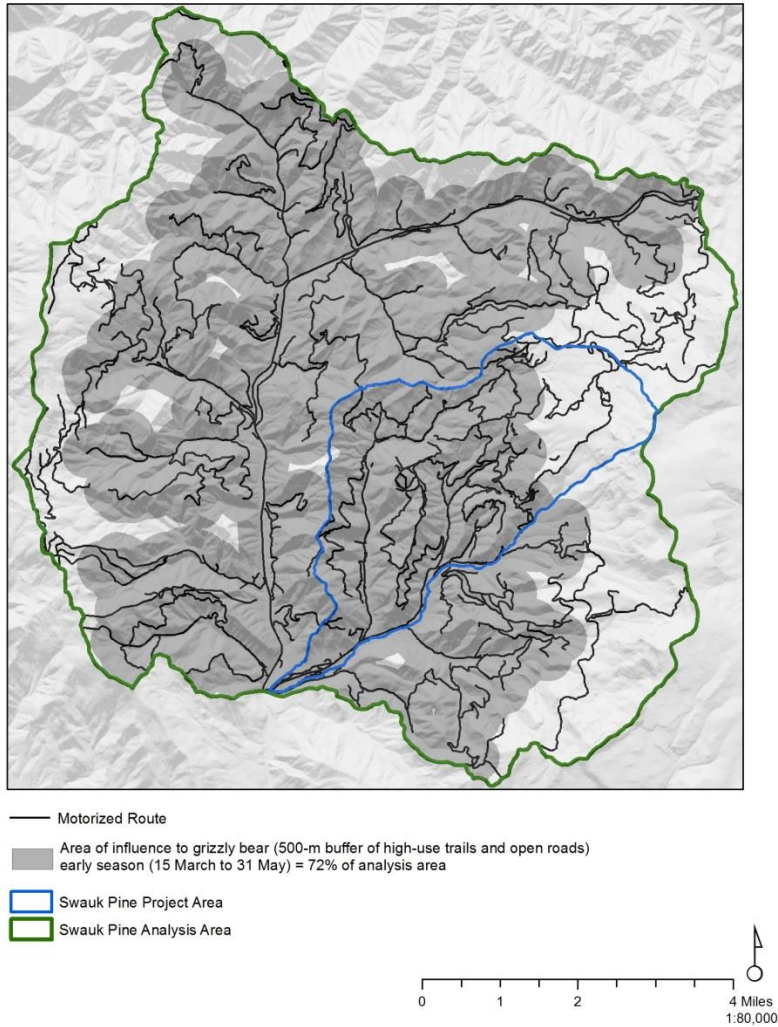


Fig. 39. Grizzly bear early season core outside of area of influence in the Swauk Pine Analysis Area. Much of this area may be snow covered early season.

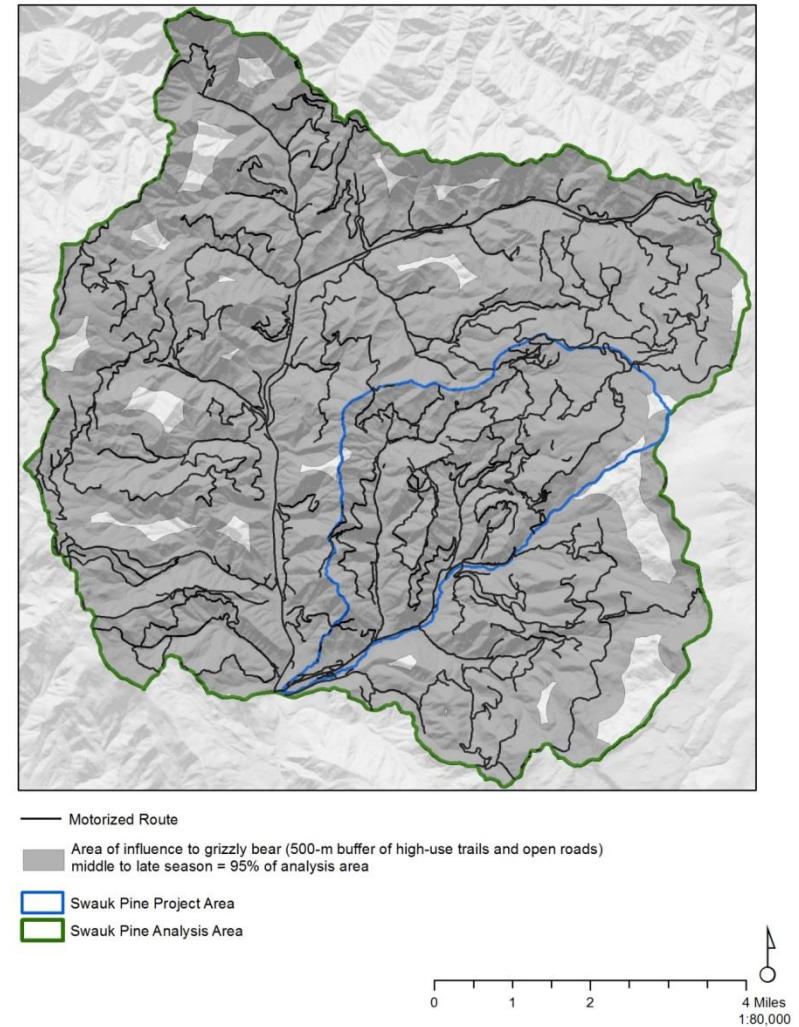


Fig. 40. Grizzly bear mid and late season core outside of area of influence in the Swauk Pine Analysis Area.

Moss-covered Talus within Old Forest

Forest Service Sensitive Species: Larch Mountain salamander [*Plethodon larselli*] and Puget Oregonian (*Cryptomastix devia*).

These species have not been detected in the Swauk Pine Project Area but potential habitat occurs on the eastern fringes of the Project Area. On this District, they have been detected only in moss-covered talus within old forest, or in old forest adjacent to moss-covered talus.

A decision was made early in the planning process to forego surveys for these species, assume occupancy of talus features, and design the project to protect talus features and surrounding vegetation. Under both alternatives all areas within 1 tree length of talus would be excluded from all harvest, operation of equipment, temporary road construction, and active ignitions. Burn plans would be designed to protect vegetation around talus from high intensity fire. Small islands of dense forest within talus would not be intentionally ignited.

With these provisions, the project is not expected to affect suitable habitat for these species. Passive low intensity fire may creep into buffers, but is not expected to alter microsites within and around talus features.

There would be no direct, indirect, or cumulative effects on populations. Consistent with FSM 2670 the project would not result in downwards population trends that would lead to federal listing of any R6 Sensitive Species under the Endangered Species Act.

Migratory Landbirds

Existing Conditions

The project area is located in Bird Conservation Region (BCR) 9, and the East Slope Cascades area. Priority habitats for landbird conservation include ponderosa pine and mixed conifer (late successional) forests (Altman and Holmes 2000). Both habitats occur—or historically occurred—in the Swauk Pine Project Area.

Population Status

A breeding bird survey using remote audio recorders in the same 12 stands as the northern spotted owl prey-base study was completed in 2015 following methods described by Furnas and Callas (2015). A human observer listened to ~32 hours of audio data and recorded occupancy of 47 species at 48 stations. A second year of pre-treatment data will be collected in the spring of 2016 for later comparison to post-treatment and control breeding bird occupancy. A Breeding Bird Survey route that runs through the Project and Analysis Area has had 93 species detected since its initiation in 1992.

Direct and Indirect Effects

Alternative 1 - No Action

In the continued absence of disturbance, the following habitat features within priority habitats for landbird conservation would decline over time in the Swauk Pine Project Area: interspersions of large patches of old ponderosa pine forest (used by white-headed woodpeckers), patches of burned old ponderosa pine forest (potentially used by Lewis' woodpecker), open understories with regenerating pines (used by chipping sparrows), grassy openings and dense thickets (used by flammulated owls), and edges and openings created by fire (used by olive-sided flycatcher).

In contrast, habitat quality for species associated with dense late successional forest (such as hermit thrush), and with large tree structure (such brown creeper and Williamson's sapsucker) may improve over time, due to increases in large trees, large snags, and structural complexity over time. Risk of uncharacteristic wildfire would continue to rise across the Project Area and surrounding watershed, along with risks to priority habitat for bird conservation.

Alternative 2 – Revised Proposed Action

A key objective for this project is to restore old forest single-story structure, dominated by large trees and presence of large snags. Planned thinning and application of prescribed fire would create openings suitable for regeneration of ponderosa pine, and would also create patches of burned trees beneficial to woodpeckers. In a nearby study Gaines et al. (2010) found thinning from below followed by prescribed fire can effectively restore habitat for many avian focal species, including neotropical and migratory species.

Both alternatives would entail removal of overstory and understory trees, reducing nesting structure and foraging opportunities for such species as hermit thrush but creating or enhancing habitat structure that may be used by white-headed woodpecker and flammulated owl. Plans to protect inner gorges and to limit treatments within Riparian Reserves would ensure continued existence of at least some dense understory vegetation for hermit thrush in treated riparian areas.

All alternatives would protect deciduous vegetation along streams, minimizing potential impacts to Lewis' woodpecker. Provisions for higher retention of snags—particularly large snags—in riparian reserves and in inner gorge areas will maintain important habitat structure for all woodpeckers, including white-headed and Lewis' woodpecker, and Williamson's sapsucker.

Harvest prescriptions would ensure retention of both the largest and oldest trees, providing key habitat features for both pygmy nuthatch (in pine forest) and brown creeper (in mixed conifer forest).

Large snags would be retained in upland harvest area wherever safety permits, but overall densities of snags (including large snags) are likely to decline in harvest areas and along roads. Snag densities would remain low along roads, due to ongoing hazard tree management and recreational firewood collection. Outside of harvest areas, prescribed burning would increase snag densities in upland forest, off-setting some of negative effects of roads on snag densities for woodpeckers.

Large snags, interspersed of grassy areas, and edges and opening created by fire would all be created in natural fuels underburn areas, improving habitat conditions for all of the focal bird species for mixed conifer forest, except hermit thrush.

Cumulative Effects on Landbirds (Alternative 2)

There are no reasonably foreseeable actions that would in combination with Alternative 2 would result in a cumulative effect to landbirds or landbird habitat. Cumulative effects stem only from past and present management actions, including previous timber harvest, hazard tree management adjacent to roads, and dispersed camping.

Consistency Finding

The project would restore ponderosa pine forest—a priority habitat for landbird conservation. Treatments would directly benefit landbirds associated with old ponderosa pine forest, including white-headed woodpecker, and would contribute to national and regional conservation efforts for this species. All landbirds would

indirectly benefit from reduced risk of uncharacteristic wildfire in the Project Area, and across the larger watershed.

Although spring logging and burning may result in unintended take of nests, eggs, or chicks, at least some of the affected pairs may re-nest once the disturbance has stopped. A long-term benefit would result from treatments—restoration of imperiled old ponderosa pine forest. Due to the length of time that this landscape has been deprived of fire, fuel loads are exceptionally heavy in places, and a spring burning option may be needed to ensure a cooler burn and retention of desired tree and log structure. Beneficial effects of this project to long-term conservation of birds associated with old ponderosa pine forest, outweigh the negative effects of unintended take. Therefore, project is conforms to requirements and intent of the Migratory Bird Treaty Act.

Effects of Proposed Herbicide Use on All Wildlife

Introduction

The proposed action includes application of herbicides (clopyralid and picloram in areas that are more than 100ft slope distance from water, and glyphosate (with no surfactant) in areas that are within 100 ft slope distance of water. Formulations of clopyralid or picloram may include the surfactant Agri-Dex, where needed to improve herbicide effectiveness. Typical application rates and risks associated with these particular herbicides are summarized in Appendix C.

For this project, herbicides would be used to spot-treat invasive plant species (primarily Russian thistle, spotted knapweed, and meadow knapweed). Most treatment would take place along open roads; however, herbicides may also be applied within treatment areas if noxious weeds are present.

Truck or ATV-mounted sprayers would be used to selectively apply herbicide when more than 50 feet from water. Backpack sprayers must be used within 50 feet of water. All wheeled equipment would remain on established roads and road prisms.

Effects from Proposed Herbicide Use

Potential adverse effects of herbicides on wildlife are based on laboratory studies of worst case exposure scenarios (100% absorption from direct spray, and indirect exposure to the highest reported residue levels (Invasives BA, pp. 127). These exposure scenarios do not account for timing or method of application, animal behavior and feeding strategies, likelihood of animal presence within treatment areas, regional constraints on use of herbicides, etc. All of these factors affect the likelihood of exposure under field conditions (Invasives BA, pp. 140).

For this project, the roadsides areas where herbicides are typically used provide little or no cover and little or no forage for herbivores; therefore, the likelihood that animal would be present and directly exposed to manually sprayed herbicide is very small. Nocturnal small mammals would be in burrows or dens, and diurnal animals would probably move away or seek cover in response to human presence. Some insects may be sprayed directly, however, and at typical application rates, a worst case chronic exposure may cause adverse effects for small mammals and small birds that feed almost exclusively on these contaminated insects. To do so, their home ranges would need to primarily overlap treatment areas—an unlikely scenario in disturbed areas dominated by noxious weeds. Therefore the number of affected small animals and birds would be extremely small.

Affected animals and birds could fall prey to carnivores and predatory birds, including the following listed and sensitive species that may occur in this project area: spotted owl, grizzly bear, gray wolf, wolverine, and Pacific fisher. Given the limited extent and location of treatment areas, the small size and number of potentially affected prey, and the high mobility and large home ranges of these predators, it is highly unlikely that any listed or sensitive carnivores or predatory birds could consume enough contaminated prey to experience adverse effects (lethal or sublethal symptoms).

SERA risk assessments indicate that a potential for adverse effect exists for any grizzly bears that consume large amounts of herbaceous vegetation with glyphosate residue (as would occur if bears fed in grassy areas that have been broadcast sprayed at the highest application rate). Such exposure is unlikely to occur in the field, because plants exposed to glyphosate die and are unlikely to be consumed by bears. For the Swauk Pine Project, glyphosate would target only invasive species using selective (not broadcast) methods at typical application rates, in disturbed areas that do not attract grizzly bears. The likelihood of exposure is very low.

Though unlikely to occur under field conditions, the worst case scenario for grizzly bears is ingestion of residue on herbaceous plants. At typical application rates the potential for adverse effect (including sublethal effects) on grizzly bears from exposure to glyphosate, clopyralid, and picloram is low and discountable. The estimated doses that would be received are below toxicity indices for all 3 herbicides. Therefore proposed use of herbicides here may affect but would not likely adversely affect grizzly bears. Control and eradication of invasive plants may be beneficial to grizzly bears, by reducing the risk of weed spread into preferred foraging areas.

The likelihood of adverse effects is even less for gray wolves (and other wide-ranging carnivores), due to low likelihood of wolf presence in treatment areas, and prey preferences. Deer and elk are unlikely to forage exclusively in treatment areas long enough to suffer any harmful exposure—therefore likelihood that wolves would ingest harmful quantities of residue from prey is even lower. The worst case exposure scenario for wolves (and probably wolverine and fisher as well) would be exposure through ingestion of contaminated small mammal prey, but the estimated doses that would be received by a medium-sized carnivore are less than toxicity indices, for all 3 herbicides (at both typical and high application rates). Therefore proposed use of herbicides may affect but will not likely adversely affect gray wolf, and may impact but will not likely adversely impact wolverine and Pacific fisher. Wolves and wolverine may benefit from control and eradication of invasive plant species in foraging habitats for deer and elk.

Noxious weeds are not typically a problem in dense forest habitats where spotted owls forage. Both owls and their preferred prey (flying squirrels) are nocturnal and arboreal, and likelihood of direct exposure to herbicide is extremely low for both species. Other prey (bushy-tailed woodrat and western pocket gopher) are also nocturnal, limiting the likelihood of their exposure. Nevertheless, a worst-case exposure scenario for spotted owls entails consumption of contaminated prey (directly sprayed animals with 100% absorption of herbicide—an unlikely scenario in itself). If such ingestion did occur, the estimated doses received by spotted owls at typical and high application rates is still below the threshold at which sublethal symptoms have been reported. Therefore proposed herbicide use may affect but will not likely adversely affect northern spotted owl.

Consistency Findings for Effects of Herbicide Use on Wildlife

Proposed use of herbicides would not adversely impact any wildlife addressed in this EA, and would not change previous consistency findings. Forest Plan standards and guidelines, as amended by the 2005 Invasives ROD, would be met, including use of authorized herbicides at recommended rates, under carefully controlled conditions that would minimize effects to wildlife.

Fish

Introduction

Lions Gulch, Cougar Gulch, and Williams Creek are the fish-producing streams in the project area. All are tributary to Swauk Creek which flows into the Yakima River approximately 11 miles downstream from the town of Cle Elum. Middle Columbia River (MCR) steelhead, interior redband rainbow trout, and westslope cutthroat trout occupy habitat in the project area; these fish are a priority of the Forest Service to conserve and recover. Swauk Creek is designated as a major spawning area and one of four strongholds for steelhead productivity for the Upper Yakima population of MCR steelhead (listed as a threatened species by the Endangered Species Act); the Upper Yakima population is considered severely depressed having an estimated spawning population of only 85 adults (YBFWRB 2009). Within the project area, steelhead occupy the first mile of habitat in Williams Creek. Occupied habitat for interior redband trout in the project area overlaps that with steelhead. Interior redband trout (a USFS Region 6 sensitive species) are the native form of rainbow (the resident form of steelhead) and are known to interbreed with steelhead indicating that native redband are important to the recovery of the Upper Yakima native steelhead population. Historically, steelhead and rainbow/reband were likely widely distributed throughout Swauk Creek and its tributaries. Westslope cutthroat trout (also a USFS Region 6 sensitive species) are widely distributed throughout the project area, occupying habitat in Williams, Lion Gulch and Cougar Gulch and the current distribution is believed to be similar to the historic distribution, although their abundance is not known.

The Swauk Watershed Assessment (Cle Elum Ranger District 1997) concluded that aquatic systems in the watershed are severely degraded as a result of past and on-going management activities. Specifically, high road densities and resource management activities in valley bottoms and riparian areas have affected the sizes and amounts of sediment eroded and delivered, increased the magnitude of peak flows, reduced in-channel and floodplain woody debris, reduced channel utilization of floodplains during overbank flows, and altered the natural flow paths of streams. These watershed level effects result in physical barriers to fish migration and degraded instream habitat and limit the subwatershed's ability to support biological processes such as spawning, rearing, foraging and migration for native and ESA listed fish species.

In order to meet the purpose and need of the proposed Swauk Pine Forest Restoration Project, the proposed action includes vegetation treatments, National Forest System (NFS) road treatments, and in-stream and riparian habitat treatments (Aquatic Restoration treatments).

Regulatory Framework

Forest Plan standards and Guidelines

Wenatchee National Forest Plan

- In riparian management areas, maintain and enhance long-term productivity to provide for riparian dependent resources including water quality, fish, wildlife and plant habitat and to at least maintain fish habitat quality and quantity at existing levels and show an improving trend in habitat availability and quality (1990 Plan pages IV-40 and 41). Specific Standards and Guidelines (pages IV-80, and IV-84 to IV-88) are intended to maintain and enhance habitat conditions for fish species and maintain water quality.

- 36 CFR 219.19 (1982 planning rule) directs forests to establish objectives for maintenance and improvement of habitat for management indicator species (MIS). Management indicator species were designated in the Wenatchee National Forest Plan (1990).

Current MIS under Wenatchee Forest Plan and that occupy habitat in the upper Swauk subwatershed include westslope cutthroat trout, bull trout, steelhead, and spring Chinook salmon.

Northwest Forest Plan

- Nine ACS objectives that focus on maintaining and/or restoring various aspects of watershed function, water quality and aquatic ecosystems.

Riparian Reserves are one component of the ACS and are a key element in achieving the nine ACS objectives. Riparian Reserves include portions of watersheds where riparian-dependent resources receive primary emphasis and where special standards and guidelines apply. Riparian Reserves are adjacent to streams, rivers, lakes, ponds, wetlands and other areas required for maintaining hydrologic, geomorphic and ecologic processes. Unstable and potentially unstable slopes are also included.

The NWFP contains standards and guidelines for Riparian Reserves that prohibit or regulate activities that retard or prevent attainment of the ACS objectives (USDA and USDI 1994 ROD pages C-31 to C-38). Standards and Guidelines that apply to this project are prescribed for timber management, road management, fire and fuel management, recreation management, riparian area management, watershed and habitat restoration, and fish and wildlife management.

Laws, Regulations, and Policies

- Endangered Species Act (ESA) of 1973 (as amended)

The following fish species (federally listed as threatened) occur in or near the Swauk Pine Project area and are listed under the ESA:

- *Columbia River Bull Trout (Salvelinus confluentus)*. Critical Habitat was designated in 2010 (50 CFR Part 17). A Bull Trout Recovery Plan was completed in April 2002.
- *Middle Columbia River Steelhead (Oncorhynchus mykiss)*. Critical Habitat was designated in 2005 (70 CFR 52630). The Yakima Steelhead Recovery Plan was completed in 2009.

- Magnuson-Stevens Fishery Conservation and Management Act (MSA)

Federal fisheries within the Yakima basin which are covered under the MSA (Pacific Coast Salmon Fisheries Management Plan) include chinook and coho salmon.

- Region 6 Regional Foresters Sensitive Species

Inland Columbia Basin redband trout and westslope cutthroat trout are Region 6 aquatic sensitive species that are suspected and/or known to occur in or near the project area (ISSSP List 2015).

Other Guidance or Recommendations

- Yakima Steelhead Recovery Plan (YBFWRB 2009)

The Yakima Steelhead Recovery Plan determined that the Upper Yakima steelhead population is at high risk for extinction based on low viability due to low spawner abundance/productivity and low spatial structure/diversity due to mainstem Yakima River flow problems and genetic flow barriers both

due to dams that impound and release water and block migration. Recovery actions identified in the Upper Columbia Recovery Plan of which the US Forest Service would be a key partner include:

- Address passage barriers by removing, replacing or fixing artificial barriers (culverts and diversions)
- Reduce sediment recruitment by improving road maintenance
- Reduce the abundance and distribution of brook trout
- Increase habitat diversity, reconnect floodplain and wetlands, restore riparian habitat, increase LWD

Methods and Scale of Analysis

The District fish biologist conducted surveys across the project area to confirm existing fish distribution records, evaluate riparian conditions, and identify opportunities for restoration and habitat enhancement. Project elements with any risk to fish or habitat were identified and incorporated into project development.

The area of direct effects analysis is located within the project area boundary. Effects to fish and aquatic habitat are accumulated effects to the nearest fish bearing stream reach and are disclosed at the project scale. Effects to fish populations are extended up to the sub-population level at the Upper Swauk Creek 6th code subwatershed (HUC12=170300010501). The temporal scale of this analysis includes the time period to execute all of the proposed actions up through the first maintenance burn (estimated 15-20 years) and extends an extra 5 years to ensure vegetative recovery on hillslopes and valley bottom restoration sites is sufficient to minimize sediment production above background levels, a total of 25 years.

The regulatory framework for riparian and fishery resources was utilized and provides the framework for this analysis. Environmental consequences of the revised proposed action and the no action alternative are evaluated with regard to the level of improvement in aquatic habitat, riparian habitat, and fish distribution within the project area (Table 3.19). ArcGIS spatial analysis determined the degree of proposed project element overlap with aquatic species and habitats.

Table 3.19. Aquatics Resource Indicators and Measures for comparing Alternatives.

Resource Element	Resource Indicator	Measure
Aquatic and Fish Habitat	Channel stability, pool quantity/quality, substrate embeddedness, LWM	Road miles within 300 ft of stream Number of road-stream crossings Amount sediment generated at road crossings
Riparian Habitat	Streamside vegetation	Acres of floodplain and wetland restored
Fish Distribution	Aquatic and riparian habitat condition	Number of road-stream crossings upgraded for fish passage

		Miles of stream channel restored
		Miles of stream accessible

Existing Conditions

Aquatic Habitat

Key components of aquatic habitat include channel stability, stream temperature, pool quantity/quality, substrate embeddedness and large woody material (LWM).

Stream channel shape and function in Lions Gulch, Cougar Gulch, and Williams Creek have been altered by roads that impinge on the floodplain, multiple road/crossings, and historic and on-going human disturbances in stream channels, valley bottoms, and riparian areas (mining, dispersed recreation, unauthorized jeep trails, grazing).

Reduced riparian area and floodplain connectivity can affect stream temperatures which are critical for cold water fish species such as steelhead, redband, and westslope cutthroat trout. Water temperature can affect the timing of life history stages of trout, including adult migration, fry emergence from redds and smoltification (timing of migration to the ocean). Stream temperature monitoring in the project area and the Upper Swauk HUC12 reveal that summer/low flow temperatures regularly exceed Wenatchee Forest Plan standards and Clean Water Act standards.

Pools provide the slower and deeper water for fish rearing, resting, and refugia. Most pools in the project area lack complexity and adequate cover for fish. Historic and on-going management activities throughout the project area have and continue to influence pool quality due to channel instability and erosive banks from road and stream interactions, suction dredging, livestock grazing, lack of LWD from recreational removal, and reduced riparian areas. Numerous stream/road crossings increase sediment inputs and alter the routing of fine sediments through the system often filling pool habitats.

Fine sediment is a natural component of streambeds however, elevated levels of fines resulting from accelerated erosion (e.g., from roads, fires, vegetation removal, mining, grazing, etc.) can adversely affect fish species spawning and rearing success. Most pronounced effects from excessive fine sediment occur during egg development and fry emergence due to suffocation and metabolic waste poisoning of eggs, and increased fry mortality due to entrapment and suffocation (Chapman 1988, Reiser and White 1988). Accelerated sedimentation rates can also lead to channel widening and down-cutting and loss of important pool habitat. In addition, changes in substrate characteristics also affect the macro-invertebrate community, which is a primary food source for resident and anadromous fishes. A variety of management activities (livestock grazing, roads, mining, timber harvest) exacerbate the naturally high background levels of fine sediment production and mobilization in the project area that aquatic species have evolved with; these on-going disturbances and cumulative effects limit the areas available for steelhead and trout to spawn in and reduces egg to fry survival of successful spawners.

Large woody material (LWM) provides nutrients and food for aquatic species, increases the diversity of instream habitat, helps dissipate the energy of water, and traps sediment from moving downstream. Loss of

stream bank vegetation can result in stream channel widening and a reduction of LWM available for recruitment to the stream. Most streams in the project area are deficient in large wood and do not meet Wenatchee Forest Plan standards for instream wood for the maintenance of channel morphology and stability, habitat complexity, and floodplain and riparian connectivity (Wenatchee Forest Plan page IV-85).

Riparian Habitat

Riparian habitat is defined by the streamside vegetation that lines water bodies and is an interface between the hillslopes and valley bottoms. Riparian areas are poorly functioning in the project area due to historic and ongoing land management activities that began in the late 1800's including mining, livestock grazing, homesteading, timber harvest, road and highway construction and recreation impacts. Most riparian areas in the project area are reduced in width and extent resulting in a lack of stream shading, changes in channel type, increases in temperature, lack of refugia and a lack of habitat connectivity. As a result, riparian function and processes are not functioning properly to maintain viable populations of fish species in the project area.

Fish Distribution

There is limited quality habitat for spawning, rearing and foraging for ESA, MSA, MIS, and Region 6 Sensitive fish species due to man-made passage barriers and poor stream habitat conditions including; lack of large wood, decreased pool frequency and quality, increased stream temperatures, and limited side- and off-channel habitat. Therefore, fish species do not currently occupy all potential and/or critical habitat that is available in the Upper Swauk subwatershed.

Environmental Consequences

Direct and Indirect Effects to Fish

Alternative 1 - No Action

Under this alternative, there would be no commercial and non-commercial vegetation treatments, there would be no road treatments (construction, reconstruction, drainage improvement) associated with timber removal and haul, and there would be no aquatic restoration actions implemented (riparian road density reduction, large wood replenishment, road drainage improvements, culvert upgrades to pass fish and flows). This alternative would result in no additional disturbances to soil or vegetation within riparian reserves however, disturbance from ongoing activities such as unauthorized road/trail use and dispersed recreation would continue. NFS roads would remain on the landscape and would be managed and maintained according to current policy, regulations, and standards. Roads within the riparian area would remain in place and continue to constrict stream channels. Poor stream habitat conditions including lack of pools and large wood, eroding banks, embedded stream substrate and lack of mature riparian vegetation would remain and would continue to impact the abundance and distribution of fish species.

Indirect effects would be the continued long term impacts to floodplain and riparian function, water quality, and fish habitat, which influence population-level viability and resilience of fish species within the project area and the Upper Swauk subwatershed. Riparian, stream channel, and floodplain disturbance particularly from the road network produce the greatest impacts to fish in the project area. Improperly designed road crossings affect the ability of fish to migrate, and impede gravel movement which can lead to bed aggradation and subsurface flows that block migration. Sedimentation limits spawning success and incubation of eggs due to inadequate flow through gravels to provide oxygen to developing eggs, and can prevent fry emergence from

gravels. Sedimentation also reduces pool volumes and decreases flows through channel widening and increased bank erosion; these changes can also contribute to the degradation of rearing and foraging habitat.

Hydrologic changes and roads in floodplains can modify the stream channel configuration; thereby reducing large wood recruitment and pools which reduces rearing opportunity and capacity. Higher peak flows and lower base flows that are related to road networks can also reduce the time and areas that fish are able to rear. Lastly, effects to riparian forest (most often from roads within close proximity to streams) influences rearing potential because riparian vegetation provides important components of rearing habitat, including shade, food supply, channel stability, and channel structure (Furniss et al. 1991).

The effects of degraded habitat would affect growth and survival of westslope cutthroat trout and redband/rainbow trout, and could have a negative long-term impact on the abundance, productivity, spatial structure and life history diversity of MCR steelhead due to their long residency in freshwater.

Aquatic Habitat

Negative impacts to in-stream habitat and structure, sediment loading and creation of habitat barriers would continue as a result from the effects that legacy road systems, timber harvest, grazing and dispersed recreation have on numerous habitat attributes including channel and floodplain structure and function, substrate, large woody material and riparian conditions.

A total of 58 miles of NFS and unauthorized roads are located within 300 feet of stream channels in the project area, and on average 28 road-stream crossings per mile of stream would remain in their current location under Alternative 1. Roads within this close proximity have a high likelihood of contributing to the loss of riparian function, degraded floodplain connectivity, decreased bank stability, altered channel morphology, and increased sediment yields (Furniss et al. 1991). The existing road network is currently contributing to sediment transport and deposition rates above natural levels (Hydrology Report), under Alternative 1 these rates and associated habitat degradation (reduced pool quality, embedded substrate and spawning gravels) would not be diminished and could increase over time as roads degrade and fail due to lack of maintenance and use (Transportation Report).

Riparian Habitat

This alternative would result in no new disturbance to soil or vegetation in proximity to stream channels or in riparian reserves. Riparian vegetation in previously disturbed areas could mature over time to provide stream shading and LWM inputs to stream channels, however the current road density in riparian reserves would remain extremely high (17.6 miles/square mile of riparian area) and dispersed recreation site impacts in riparian reserves are expected to continue to diminish the amount and structure of riparian vegetation.

Alternative 2 - Revised Proposed Action

Indirect effects have delayed or unforeseen effects to stream and riparian habitat that occur in the future or in a different location than the original action. For purposes of this analysis, negative indirect effects are associated with delayed sediment delivery and deposition to streams from instream construction activities or from areas of soil and vegetation disturbance in proximity (100-300 feet) to stream channels. As such, these indirect effects are discussed in the aquatic and riparian habitat sections.

Direct effects are impacts that result in direct effects to individuals. Instream and near stream construction activities associated with the aquatic restoration portion of this alternative that utilize large machinery within the active channel and floodplain during culvert removal, road decommissioning, LWM placement, and fill removal would have the greatest potential for direct effects to fish. Specifically, construction-related turbidity

(suspended sediment) may result in injury or death to fish in Williams Creek, Lions Gulch, or Cougar Gulch. Water drafting from fish-bearing waters for dust abatement/road maintenance could also result in direct effects to fish. Through implementation of aquatic project design criteria and mitigation measures (Chapter 2) direct effects to fish are expected to be short term and minor.

A total of 8 aquatic organism passage (AOP) culvert upgrades are proposed: 4 on Williams Creek, 3 on Lion Gulch, and 1 on Williams Creek; large wood replenishment is proposed in Lion Gulch and Cougar Gulch over approximately 8 miles of stream, and an additional 0.5 mile of Williams Creek; and fill associated with an old road/rail grade in Lion Gulch would be removed. All actions would take place in occupied westslope cutthroat trout habitat and upstream of occupied steelhead and resident redband/rainbow habitat in Williams Creek. These activities can create localized turbidity which could clog the gills of fish and/or disrupt feeding behavior; and harm and/or direct mortality to fish could occur as result of dewatering channels and fish removal when replacing culverts. Design criteria (e.g. timing, sediment control, and fish removal procedures prescribed in ARBO II) would reduce or minimize the risk. Large wood placement would not occur in de-watered channels (as with culvert replacements) and as such fish could be disturbed temporarily from foraging activity or from hiding cover during placement of large wood. Hand crews using cable winches or portable yarders and/or small tracked vehicles working on the streambanks and maneuvering trees in the floodplain during large wood placement would likely cause some streambank disturbance and increase turbidity in the stream channel at the project scale. These affects would be short term, and minimized by project design criteria.

During the height of project activities, when newly constructed and reconstructed roads are in use, haul is occurring on all routes, and in-channel restoration treatments are occurring; westslope cutthroat trout, MCR steelhead, and redband/rainbow trout spawning success could be negatively affected by sediment pulses resulting from rapid snowmelt in the spring or locally intense thundershowers. Overwintering and foraging behavior could be negatively affected by sediment pulses resulting from rain on snow events.

Prevention and Control of Invasive Plants

Herbicides are proposed to manage noxious weed species on previously disturbed ground (roads, dispersed campsites, livestock bedding grounds, etc.) throughout the project area (Botany Specialist Report). Herbicide treatment would be in accordance with standards provided in the Region 6 Invasive Plant Management Final Environment Impact Statement and Record of Decision (USDA 2005). Standards 18-20 (Appendix I, pages 5 and 6) prescribe application rates and buffer widths for aquatic habitat that were determined to reduce the risk to aquatic species (USDA 2005). In the project area, Williams Creek from its junction with Swauk Creek to its junction with Cougar Gulch is listed as Critical Habitat for MCR steelhead; westslope cutthroat trout occupy all of this habitat and MCR steelhead and native redband/rainbow trout occupy the first mile of habitat. To avoid adverse effects to MCR steelhead, application of herbicides would not occur within 50 feet of Williams Creek between late June and early August when there is a high probability of juveniles occupying stream margin habitat where potential drift from herbicide application would not dissipate from the low flow and low stream mixing stream margin habitat.

In the long term benefits from improved habitat conditions would exceed the short term negative effects to individuals.

Aquatic Habitat

Vegetation Treatments and associated actions (commercial and non-commercial thinning, natural and activity fuels treatments, road actions needed for timber access and haul, logging systems and landings):

There are several actions associated with the vegetation treatments proposed in Alternative 2 including:

- *Danger Tree Management* – approximately 1000 acres (based on 150 feet on both sides of roads) along haul routes between treatment units and the National Forest boundary would be subject to danger tree management. Danger trees that are within 1.5 times tree height from the road would be felled and left on site. There are 10.4 miles of road adjacent to occupied fish habitat that would be used as haul routes (Table 3). The potential effect to stream temperature from the removal of danger trees that provide overstory canopy and stream shading are considered in the stream temperature discussion below.
- *Fireline Construction* – approximately 1.3 miles of handline would be constructed adjacent to private property located outside of valley bottoms (in valley bottoms, road would serve as control lines) for natural fuels treatments. Waterbars would be cut into the handlines at the time of construction, and would be rehabilitated once the prescribed fire is declared out. Follow-up maintenance burning would require the lines to be rebuilt at that time (10-15 year maximum return interval for 1st maintenance burn). Design Criteria and location would minimize the potential for soil movement and delivery to surface water, therefore there would be no direct or indirect effects to fish, aquatic habitat, or Riparian Reserves.

Under Alternative 2, vegetation removal and soil disturbance would occur in proximity to stream channels as reported in Table 3.20.

Table 3.20. Summary of vegetation treatments in proximity to water bodies (proximity defined by NWFP Riparian Reserve widths), reported in acres. () indicate total riparian reserve acres in project area and vegetation treatments as a percentage of total riparian reserve area.

Vegetation Prescription	Fish-bearing streams (885)	Perennial non-fish bearing streams (12)	Intermittent Streams (1188)	Wetlands (20)	Total (2104)
Commercial harvest and underburn	47	0	226	0	273
Non-commercial thin/handpile/burn	0	0	5	0	5
Mastication thin	0	1	7	0	8
Legacy tree protection	100	0	87	12	199
Aspen/meadow enhancement	5	0	7	0	12
Natural fuels reduction (prescribed fire)	256	0	606	1	863
Total	408 (46%)	1 (8%)	938 (79%)	13 (65%)	1360 (65%)
# of Landings	10 (2 existing, 8 new)	0	17 (all new)	0	27
Miles Road constructed/reconstructed	0.4	0	1.6	0	2.0

Stream Temperature

Road Construction and Reconstruction

Effective shade for stream temperature regulation is impacted by native-surfaced roads that closely traverse stream channels. Within the project area there are currently 10 miles of road in proximity to stream channels, and all of the fish-bearing streams (Williams Creek, Cougar Gulch and Lion Gulch) are closely traversed by roads. Westslope cutthroat trout inhabit all of these streams and native redband/rainbow trout inhabit the lower reaches of Williams Creek. This alternative proposes to construct or reconstruct approximately 2.0 miles of road in riparian reserves (0.4 miles fish-bearing, 1.6 miles intermittent), all but 0.12 miles (a jeep trail that would be reconstructed for haul and then narrowed and returned to a jeep trail) would be hydrologically closed (ML-1) or decommissioned at the completion of timber haul. In most cases, the 8.4 miles of temporary road construction and reconstruction would be located in upland locations where effects to stream temperatures from the removal of canopy cover are minimized. At the end of their use (1-5 years after construction), the roads would be decompacted and/or recontoured and seeded. New openings in Riparian Reserves from temporary road construction would amount to approximately seven acres at eight locations in the project area; temperature effects to downstream fish-bearing waters would be negligible as these intermittent tributary streams contribute little surface flow if any in late summer when water temperatures reach their highest mean daily average.

Landing Construction and Use:

Twenty five new landings would be constructed within riparian reserves and two existing landings would be used. For long linear units parallel to roads, more landings than the typical one per 10 acres are prescribed with the objective of keeping landings smaller and confined to the road prism thus limiting disturbance and extra clearing for landing space (Shan Madden, personal communication). For skyline units, the majority of the landing would be located on existing roads. Twenty three of the 25 landings located in riparian reserves would serve skyline yarding systems (10 within fish-bearing Riparian reserves). Two ground based logging system landings are proposed within Riparian Reserves (one new construction), and maximum dimensions for these landings would not exceed 100 x 100 feet (0.23 acres).

No treatment/no machine entry buffers prescribed for Riparian Reserves (described below) would eliminate much of the risk of landings being located in close proximity to streams to affect canopy closures and water temperatures however, slash piles that are placed at the perimeter of landings in proximity to the riparian exclusion areas could pose a threat to mature tree canopy cover when the piles are burned. To minimize this risk, retention of overstory canopy cover in Riparian Reserve buffers must be considered in the location of slash piles at landings.

Commercial and non-commercial thinning:

A scientific literature review concluded that buffer widths of at least 90 feet from water's edge are sufficient to provide effective shade and prevent stream temperature increases (Sweeney and Newbold 2014). No treatment/no equipment entry buffers are prescribed for Riparian Reserves in all commercial and non-commercial thin stands; all perennial streams would be buffered at least 110 feet on both sides of the stream and intermittent stream channels would be buffered 50-100 feet depending on the slope. Outside these buffers at least 40% average canopy closure would be retained while emphasizing retention of large trees (>20 inches dbh), deciduous trees and shrubs, and snags and downed logs. Inventoried wetlands would be buffered by one site potential tree distance where no activity is permitted, and unmapped shallow groundwater aquifer discharge areas (swales, seepage zones) that occur on hillslopes outside of Riparian Reserves would be protected by maintaining 50% canopy closure for snowmelt and stormwater infiltration. Prescribed fire would occur in Riparian Reserves outside of the no treatment buffers and no ignition would be allowed within the no treatment areas however fire may back into them as long as mitigation measures (Chapter 2 Fisheries Mitigation

Measures) can be met and fire conditions would maintain objectives to retain coarse wood, mature canopy cover, and vegetative ground cover.

All shade within 110 feet of fish-bearing streams and non-fish bearing perennial streams in the project area would be maintained and although 79% of intermittent stream channel Riparian Reserves would be subjected to understory thinning within 50-150 feet of the channels, temperature effects to downstream fish-bearing waters would be negligible as these tributary streams contribute little surface flow if any in late summer when water temperatures reach their highest mean daily average. Protection of upslope groundwater recharge areas in concert with large wood replenishment (discussed below) would have a beneficial effect to fish-bearing waters downstream. Overall, commercial and non-commercial thinning and prescribed fire activities would have no direct effect on fish habitat or indirect effects on fish species due to stream temperature changes in the project boundary or downstream.

Fine Sediment – Vegetation Treatments

No treatment/no equipment entry buffers prescribed for all Riparian Reserves are expected to prevent any measureable increases in sediment deposition to the stream network from vegetation treatments (commercial and non-commercial thinning, prescribed fire). Stream buffers up to 30 feet wide have been shown to trap about 65% of sediments delivered by overland flow, while 90 foot buffers can be expected to trap about 85% of sediments and a larger fraction of finer silts and clays (Sweeney and Newbold 2014). Prescribed fire treatments would be conducted when conditions are conducive for low-severity fire behavior in Riparian Reserves. There would be no direct ignition in the no treatment buffers but low intensity backing fires would be allowed. Activity slash piles (at landings or in treatment units) that are burned in proximity to stream channels pose a greater risk to introducing sediment to streams because they often burn at high intensity due to concentrated fuel loads, and can consume duff and litter that protect soil from erosion and produce water-repelling soils that increase soil erosion from the site. As described under temperature effects above, consideration for the location of landing piles should be employed to reduce the risk of sediment delivery to stream channels. To minimize the risk to westslope cutthroat trout in Williams Creek, Lions Gulch and Cougar Gulch, landings located within the Riparian Reserves of these streams would locate slash piles at least 100 feet away from the streams (as consistent with no equipment buffer widths). Additionally, natural and activity slash jackpot piles would not be burned within 100 feet of perennial stream channels or 25 feet of intermittent stream channels to minimize the risk of sediment delivery to Williams Creek, Lion Gulch and Cougar Gulch.

Fine Sediment – Roads

The stream and road density in the project area increases the risk for erosion and sediment delivery to streams and transport downstream to aquatic habitat. The current annual average sediment production from road stream crossings delivered directly to streams is estimated at 50 tons in the project area (Hydrology Report).

For the purposes of commercial log haul, this alternative proposes new temporary road construction followed by decommissioning after use, reconstruction of unauthorized roads followed by decommissioning and/or conversion to OHV trail, heavy maintenance (blading, ditch clean-out, installing drainage dips, and brushing) and new construction to relocate a NFS road. Table 3.21 summarizes these road actions in relation to their proximity to occupied fish habitat and Critical Habitat designated for MCR steelhead. These road activities would disturb road surfaces and/or soils connected to or in proximity to streams with a high probability of delivering sediment to the stream network and occupied fish habitat due to insufficient vegetative buffers to effectively trap fine sediment. As described above, the majority of new temporary road construction is located in upland locations where stream channels are intermittent to minimize the potential for sediment delivery to

aquatic habitat downstream. Regular and heavy maintenance on haul routes located in close proximity to Williams Creek, Lion Gulch Creek and Cougar Gulch Creek have the greatest potential to impact occupied fish habitat; effects from existing roads on the aquatic environment involve sediment generation and altered routing from both road maintenance and vehicle use. Haul traffic on wet road surfaces from dust abatement activities and during seasonally wet weather can develop ruts in the road surface which contribute to rills and gullies that deliver sediment directly to stream channels. Mitigation Measures that limit haul traffic during seasonally wet periods and that regulate the use of watering for dust abatement can be effective at diminishing these effects. Other sources of sediment associated with the road system in the project area are undersized stream crossing culverts with few sized sufficiently to pass the 100 year flow event; large fine sediment deposits are frequently observed in streambeds adjacent to road crossing culverts in Lion Gulch, Cougar Gulch and Lower Williams Creek (Hydrology Report). While pre-haul and regular maintenance requirements can lessen the impact of road generated sediment before, during, and after project activities, the existing problems associated with roads adjacent to occupied fish habitat (poorly located and undersized culverts) would not be addressed with the vegetation actions associated with this alternative and would persist. Localized short term effects could last throughout the time span to complete the vegetation actions however, not all road activities are expected to occur at the same time so the magnitude of effects may be less but the duration of the effects would be longer. Upon completion of haul activities, from 1-10 years after initial road construction/reconstruction activities, all temporary and unauthorized roads constructed/reconstructed would be decommissioned and erosion and sediment delivery rates would be expected to return to pre-project levels.

Table 3.21. Summary of road actions associated with vegetation treatments (WCT = westslope cutthroat trout, ST = MCR steelhead, RB = native redband/rainbow trout).

Action	Total Amount (Miles)		Miles within 300 ft of Occupied Habitat		Miles within 300 ft of MCR Steelhead Critical Habitat	
	During	After	During	After	During	After
<i>New construction (temp roads)</i>	7.9	0.6	0	0	1.0	0
<i>Road Reconstruction (unauth and OHV routes)</i>	1.4	0	0.03 WCT 0.02 ST	0	0.01	0
<i>Road maintenance level/system conversion (ML-1 or closed ML-2 to open ML-2)</i>	3.7	1.1	0.3 WCT	0.01 WCT	0	0
<i>Opening ML 1 Hydrologically Closed Roads</i>	1.6	0	0	0	0	0
<i>Upgrade Existing Stream Crossings as part of road improvements needed for log haul, etc.</i>	0	0	0	0	0	0
<i>Log Hauling</i>	46.8	0	10.4 WCT 0.1 ST 0.1 RB	0	5.0	0
<i>Heavy Maintenance</i>	31.1	0	2.1 WCT 0.1 ST 0.1 RB	0	3.0	0

Aquatic Restoration Treatments

Indirect effects to fish could occur from aquatic restoration activities that occur within 300 feet of stream channels such as decommissioning 14.6 miles of system and unauthorized roads throughout the project area; improving road drainage on valley bottom roads in Cougar, Lion, and Billy Goat gulches and headwater tributaries in Lion Gulch; improving stream crossings on tributaries to Williams, Cougar, Lion, and Billy Goat Gulch; removal of a dam and diversion on a tributary to Cougar Gulch; and modification of dispersed recreation sites in Lion and Cougar Gulches. In total, there are 59 restoration sites (including those with direct effects to fish discussed above) in the project area and 55 of these occur in proximity to stream channels (22 intermittent, 33 perennial). These action would not affect temperature as no vegetation removal is associated with them. There is the potential however for sediment delivery to stream channels which would be similar to those described for road actions above as these activities would disturb soil in proximity to stream channels. These actions would not occur all at once but could overlap vegetation treatment actions. All aquatic restoration actions could be completed in 2-3 years, and would overlap in space and time with proposed vegetation treatments (timber removal and fuels reduction). There is the potential for localized and temporary sediment movement and delivery to stream channels in the project area for up to 10 years, however as each of these aquatic restoration actions is implemented the overall risk to aquatic habitat is minimized as AOP's would provide additional habitat; drainage networks would shrink from road drainage improvements and road decommissioning; and large wood replenishment would improve floodplain and stream channel connectivity, capture spawning gravels, scour pools, vertically stabilize stream channels and improve hiding cover and forage. These indirect beneficial effects may take 5-20 years to realize as stream channels stabilize, riparian areas revegetate and recover, flow regimes improve, and substrates are scoured of fine sediment.

Direct and Indirect Effects to Riparian Habitat

No treatment buffers prescribed for vegetation treatments would prevent the loss of canopy and ground cover which act to regulate instream temperatures and filter fine sediment. Large wood replenishment in Lion Gulch, Cougar Gulch, and lower Williams Creek would allow for tracked machinery into the no treatment area of the Riparian Reserve and removal of overstory canopy as long as 60% canopy cover is maintained to minimize instream temperature increases. In most cases, tractors and excavators would remain on roads and other previously impacted areas unless Forest Service personnel determine that they can travel off-road in a manner that would not impact water quality or affect hydrologic functions.

Road decommissioning in Riparian Reserves would restore 178 acres of riparian habitat, and dispersed recreation site modification would restore an additional 5 acres of riparian habitat. Some riparian function would be restored in 5-25 years as grass, forbs, and shrubs become established and can filter sediments, provide some shading, and improve the riparian micro climate for other vertebrate and invertebrate species. Full riparian function as defined by mature successional classes of conifer and hardwood trees however, would not be realized for 80-100 years.

Summary and Comparison of the No Action and Revised Proposed Action

Commercial thinning, non-commercial thinning, and prescribed natural and activity slash fuels treatments would not negatively affect fish or fish habitat in the project area due to treatment exclusion areas in Riparian Reserves that are sufficient in size and extent to prevent temperature increases, sediment introductions, or removal of habitat forming LWM. Similarly, new temporary road construction, existing road reconstruction, and landing construction and use would avoid Riparian Reserves for the most part through project design.

The project design for Swauk Pine strove to “design” out much of the risk to aquatic systems through riparian exclusion areas, vegetation treatment prescriptions (Hydrology Report), and site location for temporary roads and landings. Additional measures (Chapter 2 Fisheries Mitigation Measures) would apply to all road maintenance activities and road drainage improvements to minimize effects to water quality and fish habitat. Recent effectiveness monitoring and reporting of National Core Water Quality BMP’s (USDA 2015) have found that implementation of the BMP’s (that is translating BMP from planning document to action document) has been reasonably successful (67% in 2014) for road drainage improvements but marginally successful (50%) for road maintenance activities. The BMP’s when implemented were only 22-36% effective (in other words, over 60% of the time BMP’s were not implemented effectively to minimize adverse effects to water quality). The Okanogan-Wenatchee National Forest has not employed National Core Water Quality BMP monitoring for road maintenance but personal observations indicate that BMP’s when implemented correctly are effective and successful in reducing pollutants (sediment) to water bodies. Based on these monitoring results and the density of roads located within proximity to stream channels, heavy road maintenance activities in combination with road construction and reconstruction, and road decommissioning activities would have more than a discountable risk of introducing sediment to stream bodies. In the long term after all road treatments are completed, we expect a reduction of 6 tons annually of road generated sediment at stream crossings (Table 3.22). This is a minor improvement that begins to move stream channels in the project area toward improved conditions.

Under Alternative 2 Aquatic Restoration actions would reduce NFS road miles and unauthorized roads/trails on National Forest from 60 miles to 30 miles in the project area, and NFS road density would be reduced to 3.6 miles/square mile in the Upper Swauk subwatershed. Road densities greater than 1.7 miles/square mile have been found to result in negative impacts to aquatic resources (Quigley and Arbelbide 1997) and therefore negative impacts to aquatic habitat would continue although to a lesser extent than in Alternative 1. Roads within 300 feet of streams have the greatest potential to negatively impact stream habitat and under Alternative 2 USFS road mileage (including unauthorized roads/trails on National Forest) within 300’ of streams would be reduced from 58 miles to 43 miles (6.4 miles/square mile) and road-stream crossings would be reduced from 240 to 139 (through NFS road and unauthorized road and trail closures and decommissioning).

The most beneficial expected changes from the Aquatic Restoration treatments would be improved instream and floodplain function in Lion, Cougar, and Billy Goat Gulches from LWM replenishment, road and trail decommissioning, road drainage improvements, and dispersed recreation site modifications; these are described in detail in the Hydrology Report. Together these actions would increase floodplain and stream channel interactions that contribute to riparian vegetation development and function, dissipate flood energy, restore shallow groundwater recharge areas within Riparian Reserves to return cooler water to stream channels, and increase instream habitat complexity for pool and side channel formation, sediment trapping for spawning and rearing substrate, and hiding cover for fish.

These positive changes in habitat function would lead to improved growth and survival of individual fish through enhanced spawning, incubation, rearing, and migration. Westslope cutthroat trout, MCR steelhead and resident redband/rainbow are most likely to benefit from these restoration action due to their current distribution and residency in project area streams. Lesser benefits may occur for bull trout which occur less frequently and lower in the watershed.

Table 3.22. Aquatics Resource Indicators and Measures comparing Alternative 1 - No Action and Alternative 2 - Revised Proposed Action within the Williams Creek drainage (project area).

Resource Element	Resource Indicator	Measure	Alternative 1	Alternative 2
Aquatic and Fish Habitat	Channel stability, pool quantity/quality, substrate embeddedness, LWM	Road miles within 300 ft of stream	58	43
		Number of road-stream crossings (NF system and unauthorized roads/trails)	240	139
		Amount sediment generated at road crossings	50 tons annually	44 tons annually
Riparian Habitat	Streamside vegetation	Acres of floodplain and wetland restored	0	426 acres
Fish Distribution	Aquatic and riparian habitat condition	Number of road-stream crossings upgraded for fish passage	0	8
		Miles of stream channel restored	0	9
		Miles of stream accessible	ST = 1.0 RB = 0.8 WCT = 14.6	ST = 5.5 RB = 5.5 WCT = 14.6

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Resource Indicator and Measure 1

Aquatic and fish habitat would be improved at the project scale under Alternative 2. Fifteen miles of road (NFS and unauthorized) within 300 feet of stream channels would be decommissioned resulting in 101 fewer stream channel crossings. Decommissioning and culvert removal combined with stream channel restoration at these sites, would improve channel stability and stream habitat condition. There would be less sediment delivered directly to stream channels at stream crossings. As stream channels and riparian areas recover and begin to function appropriately, road sediment delivery rates to stream channels are expected to lessen as floodplains and riparian areas would capture, filter, store, and attenuate fine sediment accumulations in aquatic habitat.

Resource Indicator and Measure 2

Approximately 380 riparian acres would be restored under Alternative 2. Restoration actions include large wood replenishment and road decommissioning (NFS and unauthorized routes) in Williams Creek, Lion Gulch, Cougar Gulch, and Billy Goat Gulch that would improve riparian function across 226 acres. Road decommissioning would restore valley bottoms to functioning riparian habitat; and large wood replenishment would halt stream down-cutting to allow stream channels to interact with their floodplains and produce

functioning riparian habitat. Additional road treatments (constructing effective closures and redesigning crossings) and dispersed recreation site modification would improve an additional 5 acres of riparian habitat. In the short-term these actions would improve riparian soils and natural flow paths to reduce sediment delivery to streams and improve groundwater recharge and instream temperatures for fish. In the long-term, riparian areas in the project area would be vegetatively and spatially connected with improved instream flows, thermal regulation, channel stability and complexity, flood flow attenuation, and viable populations of native plant, vertebrate and invertebrate species.

Resource Indicator and Measure 3

Miles of stream accessible to fish would be increased by upgrading culverts on roads in Lion Gulch and Cougar Gulch for aquatic organism passage, increasing the available habitat for MCR steelhead and redband/rainbow trout in the project area and improving passage for westslope cutthroat trout that currently occupy these waters.

Stream channel restoration through the addition of large wood, decommissioning of roads and trails within 300 feet of streams, and decommissioning (active and passive) 101 stream crossings, would improve 9 miles of instream habitat. Together with the 8 AOP's, Alternative 2 would provide improved access to spawning and rearing areas within Lion and Cougar Gulch and improved stream habitat and function throughout the project area.

Cumulative Effects

The spatial boundary includes the Upper Swauk subwatershed (HUC 12) and the mainstem Swauk Creek for approximately one mile below the confluence with Williams Creek. The temporal boundary of cumulative effects to aquatic habitat and fisheries spans from the late 1800's when management actions in the subwatershed began to have an impact on aquatic habitat and fisheries on a large scale, and continues up to 20 years following the completion of all activities associated with Alternative 2 when benefits from restoration projects would become apparent.

Leading up to implementation, numerous past and ongoing management actions have affected and continue to affect fish populations, aquatic habitat, sediment yields and watershed function in the Upper Swauk subwatershed and these are disclosed in the existing condition. Present and reasonably foreseeable future actions in or near the Swauk Pine project area are listed at the beginning of this chapter. Of those activities, the following are relevant to the aquatic and fisheries habitat resource for cumulative effects.

- Ongoing and future timber harvest, fuels reduction activities, and associated road construction and reconstruction on Forest Service Lands. Improved watershed conditions are anticipated to result over time due to decreased fire potential and improved forest health which would lead to long-term positive benefits at the watershed scale. However, road management actions associated with ongoing timber sales (Orion and Iron) have not minimized impacts with aquatic resources and these impacts would continue for the foreseeable future.
 - Aquatic Organism Passage projects on Swauk Creek (completed by Department of Transportation) and Williams Creek (completed by USFS) have recently increased available habitat for fish species within the Upper Swauk sub-watershed; this project in concert with future planned AOP's (Swauk Creek above Iron Creek by Department of Transportation) would further increase available habitat for fish species in the Upper Swauk.
- Ongoing and future mining activity would continue in the Swauk Pine project area and the Upper Swauk subwatershed and would continue to have negative impacts on riparian and instream

vegetation and stream substrates. These impacts have been considered in the existing condition of fish and riparian habitat.

- Sheep grazing under the Swauk Allotment Management Plan. The Swauk Sheep Allotment would continue to be utilized, however deferment of grazing activities would be employed where necessary to mitigate potential adverse effects to vegetation establishment in project treated areas. Trailing routes include roads through Riparian Reserves in Lion Gulch and Cougar Gulch, where in the past, damage to streambanks from vegetation removal and hoof damage has contributed to increases in sediment delivery and mobilization.
- Implementation of the Okanogan-Wenatchee National Forest Access and Travel Management Plan would designate an open road system for motorized use. It would not however result in fewer roads on the landscape, individual project level analyses would make recommendations and decisions on future road management actions such as hydrologic closure, decommissioning, and maintenance levels that could benefit watershed and aquatic habitats. Travel management is expected to reduce the extent of unauthorized road and trail development and use, however some Forest Service research suggests that implementing management regulations alone may not be sufficient to improve the status of stream and riparian function within managed watersheds in the short term (10-20 years) (Al-Chokhachy et al. 2010).
- Annual road repair and maintenance projects in the Upper Swauk subwatershed would continue to be limited due to budgets; this project reduces system roads by 5.3 miles which would be fewer miles with a backlog of needed maintenance but not a significant amount of reduction to decrease risks to aquatic resources. 15.6 miles of unauthorized roads would be decommissioned which would increase benefits to aquatic resources.

Although not an action that is planned and implemented, future climate change may produce profound impacts to fish and aquatic habitat. In the eastern Cascades, snowpack is expected to persist at higher elevations but at diminished levels, which may result in lower summer flows and potentially an increase in stream temperatures that are stressful for native salmonids. Additional changes in streamflow regimes that may be expected include peak streamflow occurring earlier in the spring, an increase in flood intervals, and reduction in low flows. Warming streams, declining summer flows, and increasing flood risk are all expected to negatively affect coldwater fish populations. Climate change could also influence the distribution of non-native fishes, such as eastern brook trout and non-native rainbow trout, as they are typically more tolerant of higher water temperatures (Gaines et al. 2012). Changing flow regimes, including the timing and magnitude of spring floods, could potentially increase egg mortality due to gravel scour for spring spawning species such as steelhead, redband and westslope cutthroat trout.

The overall cumulative effect of past activities in the Upper Swauk subwatershed has been toward the loss and degradation of instream habitat and reduction in fish populations, water quality and hydrologic function. Recent actions, including vegetation treatments and fuels reduction projects, are an attempt to initiate the recovery and restoration of the subwatershed, however the open road density and impacts from undersized culverts and deferred road maintenance in the subwatershed would continue for the reasonably foreseeable future. Alternative 2 of the Swauk Pine Restoration Project would improve and recover stream habitat function and increase the distribution and abundance of fish species in the Williams Creek drainage and could provide refugia in the future for fish populations in the Upper Swauk. Climate-related factors such as temperature and streamflow could affect habitat in different ways and at different scales, therefore a diversity of well-connected

habitats on public lands will be important to maintaining species viability, and may contribute towards recovery of MCR steelhead as the climate continues to warm.

Considering past, present, and reasonably foreseeable actions, MCR steelhead, redband/rainbow trout, and westslope cutthroat trout are exposed to some cumulative increased risk in Swauk Creek and its tributaries in the Upper Swauk subwatershed for the foreseeable future, specifically increased sediment as a result of instream project implementation, and from existing and continued elevated background effects primarily from high road densities in proximity to stream channels.

Consistency Findings

Wenatchee National Forest Management Plan.

All goals and standards/guidelines from the plan were reviewed prior to project development and integrated into the project design for all alternatives. The proposed action is consistent with this direction and Aquatic Restoration treatments would improve habitat conditions for fish and aquatic habitat. MIS fish identified in the plan would continue to persist as viable populations if this project is implemented.

Habitat Viability Determination for - Management Indicator Fish Species

Cutthroat trout occupy approximately 1,014 miles of habitat on the entire Wenatchee National Forest, and approximately 14 miles of habitat potentially affect by the project (approximately 0.01 percent of Forest distribution). Within the Upper Swauk subwatershed, cutthroat trout are widely distributed across approximately 27 miles of habitat within the National Forest.

Vegetation treatments would cause no effect to MIS habitat. Haul routes on system roads and associated maintenance, new temporary road construction, and road reconstruction in the project area may cause short term affects to MIS habitat from increased sediment delivery to habitat. Large wood supplementation to Lion Gulch, Cougar Gulch, and Williams Creek would indirectly benefit MIS habitat by restoring approximately 9.0 miles of occupied habitat.

Although individuals may be negatively affected by disturbance during LWD supplementation in the short term, this project element will improve habitat for cutthroat trout at the site scale for the long term. Therefore, this project should improve their viability on the Wenatchee National Forest, and not contribute to a negative trend.

R6 Sensitive Fish Species

Redband trout occupy roughly one mile of habitat in the project area and are distributed throughout the mainstem of Swauk Creek, occupying approximately 11 miles of habitat. Large wood replenishment is the only proposed project that occurs within or in proximity to habitat for redband trout. There may be short term negative effects to individual during wood supplementation however, in the long term the benefits of wood supplementation to Williams Creek will improve habitat conditions and the viability of redband trout in the Swauk subwatershed.

NWFP

Standards and guidelines from the NWFP plan were reviewed prior to project development and integrated into the project design. The Proposed Project is consistent with this direction.

ACS

Project Consistency with ACS objectives are detailed in the Hydrology Report. The proposed Aquatic Restoration actions are a necessary component of the Swauk Pine Restoration project which provide the long-

term improved aquatic and hydrologic conditions in the project area that are needed to meet the intent of the ACS.

ESA

This project has been designed to promote the conservation of ESA-listed MCR steelhead habitat. Only short term, discountable effects are expected, and the project would accomplish project scale watershed restoration that will maintain occupied habitat of ESA fish and their designated Critical Habitat. Columbia River bull trout occupy habitat in the lower reaches of Swauk Creek (also Designated Critical Habitat) approximately 9 miles downstream of Williams Creek where project level disturbances (sediment) would not be discernable. This project would not jeopardize the continued existence of MCR steelhead or Columbia River bull trout, or result in the destruction or adverse modification of their designated critical habitat. This project is therefore consistent with ESA direction.

MSA

All streams currently or historically occupied by spring Chinook and/or coho salmon in the project area have been designated as EFH by NMFS. No adverse effects to EFH are expected to occur under Alternative 2. This project is consistent with the MSA.

Transportation

Introduction

Roads and travel routes are defined by the Forest Service as follows:

- 1) Forest System Road (FSR), also referred to as National Forest System Road: A forest road other than a road which has been authorized by a legally documented right-of-way held by a state, county, or local public road authority (36 CFR 212.1). Note that a Forest Road is a road wholly or partly within or adjacent to and serving the NFS that the Forest Service determines is necessary for the protection, administration, and utilization of the NFS and the use and development of its resources (36 CFR 212.1).
- 2) Non-System Road: Roads on the forest that are authorized by a legally documented right-of-way and are not needed by the Forest Service to manage the forest. These roads stay on the landscape for indefinite periods of time and thus do not meet the definition of a temporary road. Examples include; utility access roads, and private drive-ways, etc. The authorized entity is responsible for all construction, operation, and decommissioning costs of these roads. The USFS cannot expend system road maintenance funds on non-system roads. *Note: roads authorized under a special use permit or mining plan of operation are Non-System Roads.*
- 3) Unauthorized Road: A road that is not a FSR, Non-System Road or Temporary Road.
- 4) Temporary road: A road necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a forest road and that is not included in a forest transportation atlas (36 CFR 212.1). Note that these roads are on the landscape for a relatively short and defined period of time and are associated with a specific project or mining plan. Examples include; timber sale roads, mining access road, abandoned mine reclamation access roads, etc. Temporary roads are typically not open to the public.

The majority of roads within the Project Area have existed for better than 60 years; in fact Liberty, WA is the oldest mining town site in the state. Portions of the system date back to mining and logging that began after gold was discovered in Swauk Creek in 1873.

The Project Area encompasses: a road use permit for snow plowing, a permit for an underground telephone line (T20NR17E Sections 1, 2, and 11), and a permit for a water transmission line (T20NR17E Section 2). It also encompasses several special use permits that allow access for various reasons in and around the Liberty Mountain Owners subdivision.

The existing road system is employed by a number of specific users in support of their endeavors. Utility companies utilize the road system to repair utility lines. These uses, although not a significant component of the total usage, have occurred for many years and will continue into the foreseeable future. Providing a small usage are roads to access miners' active mining claims. Miners' legal access is provided on open system roads or roads approved by the authorized official (typically a District Ranger) under an official "Plan of Operations" as allowed by United States Code of Federal Regulations (CFR 36 Part 228.4 & 228.12). Grazing allotments add a minute vehicle usage component and is limited to the requirements of the allotment. Winter vehicle use is limited to the roads in which snow plowing occurs, typically on the county roads with limited exceptions on the forest service roads during active winter land management or to access winter recreation. The bulk usage on the majority of the roads occurs in the late summer and fall with the commencement of deer and elk hunting seasons. The anticipated future use patterns will be fairly reflective of current trends of administrative and land management-related use, along with mining, grazing, and mushroom picking access throughout the spring, and summer.

The desired condition is to provide a road system that is safe, affordable, has minimal ecological impacts, and meets immediate and projected long-term public and resource management needs. The current direction for management of the road system is found in the

Regulatory Framework

Forest Plan Standards and Guidelines

- Under the 1990 Wenatchee National Forest Land and Resource Management Plan (LRMP), the strategy for the Forest's transportation system is "to provide road access to developed sites to a service level comparable with their development level, to correct chronic sediment sources and prevent fish barriers, to maintain the current pattern of dispersed recreation, and to not improve access to wilderness areas to the extent that wilderness values are reduced."(LRMP pg. 4-60)
- Current guidance for management of roads in LSR is to generally reduce road density. For habitat effectiveness the long term management objective for these areas is to manage towards a "high" level of habitat effectiveness (defined as >1mi. /sq. mi. open road density) and >70% security habitat." (Assessments for LSRs and MLSRs pg. 351)

Laws, Regulations, and Policies

A small portion of the Project Area is located in "Inventoried Roadless Area" designated under the Roadless Area Conservation Rule. Forest Service direction for these areas is to "prohibit road construction, reconstruction, and timber harvest except for stewardship purposes, while accepting road reconstruction needed for road safety improvements, and Federal Aid Highway Projects." (Forest Service Roadless Area Conservation FEIS Summary pg. S-9)

Methods and Scale of Analysis

All roads in the planning area were mapped in the field using a hand-held global positional device. ESRI ArcMAP software was used to analyze proposed changes to the Forest Road and Trail Systems. The analysis addressed short (0 to 5yr) and long (>5yr) term effects.

Existing Conditions

The Swauk Pine Project Area is located in and around the historic Swauk Mining District of Liberty, Washington. Ore was accessed by dredging and timber was frequently skidded down drainage areas; as a result some of the transportation system is located within the natural drainage areas. Additionally, the majority of roads in the PLTA are located on steep terrain, with ground slopes exceeding 50%.

The Project Area encompasses 70.38 miles of road. Of these, 7.16 are non-system roads under various private and public jurisdictions that include federal, county, and private entities. There are approximately 10.65 miles of mapped unauthorized roads, including some roads that may be used for mining access. Another 1.95 miles are roads that also share use with trail users (dual use road/trail).

Costs associated with maintaining the Forest Service road system at current maintenance levels has become impractical under current funding levels, as a result the Forest Service is currently only able to maintain about 20% or less of its road system each year. As a result, the Swauk Pine Project Area road system is in need of road maintenance/reconstruction, and roads causing resource damage are in need of decommissioning.

**Table 3.23. Current roads in the planning area.
(OPML is the operation maintenance level).**

Alternative 1	Status	Miles
OPML 1 – BASIC CUSTODIAL CARE (CLOSED)		7.53
Closed Road	4.77	
Decommissioned (update in INFRA)	0.60	
Dual Use (road/trail)	0.58	
Open Road	1.59	
OPML 2 – HIGH CLEARANCE VEHICLES		29.77
Closed Road	4.64	
Dual Use (road/trail)	1.37	
Open Road	23.76	
OPML 3 – SUITABLE FOR PASSENGER CARS		12.96
Open Road	12.96	
OTHER		20.12
Nonsystem Roads	7.16	
Decommissioned	2.31	
Unauthorized Road (UAR)	10.65	
Total miles		70.38

A Travel Analysis was completed for all roads within the project area. The Interdisciplinary Team (IDT) evaluated current conditions on each road and the road management objective. Travel Analysis also provided an opportunity to assess the needs, assets and liabilities of each road, and to identify road closure and

decommissioning opportunities as well as which unauthorized roads, if any, should become part of the National Forest road system. The recommendations identified in the Travel Analysis provided the basis for road management proposals made as part of the project proposed action and is available in the project record.

Environmental Consequences

Direct and Indirect Effects

Alternative 1 - No Action

The existing road system would experience no administrative changes in its current status. No roads would be closed, decommissioned, or otherwise change maintenance levels; no stream crossings would be removed; public access to currently open system roads and unauthorized roads would remain the same. Selecting the No Action alternative would not provide for long-term sustainable resource management, reduced maintenance costs, and reduced impacts on habitat and hydrologic function.

Additionally, recreational enthusiasts wouldn't have the opportunity to enjoy a better trail system, and subdivisions and neighborhoods that normally benefit from logging activities both economically and through road maintenance, would see little improvements.

Selecting the No Action alternative would not provide for long-term sustainable resource management, reduced maintenance costs, and reduced impacts on habitat and hydrologic function.

Table 3.24a

Alternative 1 – No Change	OPML	Miles
Closed Roads	1	4.77
	2	4.64
Closed Road Total		9.41
Decommissioned Roads	1	0.60
	UAR	2.77
Decommissioned Road Total		3.37
Dual Use (road/trail)	1	0.58
	2	1.37
Dual Use (road/trail) Total		1.94
Nonsystem Roads		7.16
Nonsystem Road Total		7.16
Unauthorized Roads		10.65
Unauthorized Road Total		10.65
Open Roads	1	1.59
	2	23.76
	3	12.96
Open Road Total		38.30
Total miles		70.83

Alternative 2 - Revised Proposed Action

Commercial haul activities and other vegetative treatments proposed in this Alternative would result in the use of approximately 47.21 miles of system roads under USDA.-Forest Service jurisdiction. During the course of treatment activities, approximately 3.22 miles of roads currently closed and in custodial status as ML 1 roads would be opened. While this would result in a short-term increase in open-road densities, the exact magnitude of the increase would be impossible to predict. The majority of maintenance/reconstruction work would be performed on 24.12 miles of ML 1 and 2 roads used for commercial activities, in particular blading, drainage, and brushing. There is a proposed relocation of the 9718112 road.

Table 3.24b. Alternative 2 Post-project status of roads.

Existing OPML	Post Project Status	Miles
1 – BASIC CUSTODIAL CARE (CLOSED)	Closed Road	3.09
	Decommissioned Road	3.39
	Dual Use (road/trail)	0.58
	Open Road	0.47
1 – BASIC CUSTODIAL CARE (CLOSED) – Total		7.53
2 – HIGH CLEARANCE VEHICLES	Closed Road	2.19
	Decommissioned Road	3.76
	Decommissioned System Trail	0.06
	Decommissioned UAT	0.10
	Dual Use (road/trail)	0.24
	Open Road	22.45
	System Trail	1.13
2 – HIGH CLEARANCE VEHICLES – Total		29.92
3 – SUITABLE FOR PASSENGER CARS	OPEN ROAD	12.96
3 – SUITABLE FOR PASSENGER CARS		12.96
OTHER	Decommissioned	0.22
	Decommissioned Road	10.26
	Decommissioned System Trail	0.61
	Decommissioned UAR	10.03
	Decommissioned UAT	3.58
	Non-system road	7.16
	Open Road	0.39
	System Trail	6.48
OTHER Total		38.74
Grand Total		89.15

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System Road Relocation/Construction

Any new/realigned system road construction would ultimately reduce the overall system road miles as we would concurrently close the previous access that was causing resource damage. Strict standards of construction would be adhered to in addition to typical Forest Service Standards, specifications, and BMPs (Best Management Practices). The new/realigned roads would be designed with: rolling grades or frequent undulated road profiles, outsloping and hardening (where appropriate), located as close to the ridge top as feasible, and would meet the overall restoration strategy of the project by reducing water/road interaction.

Temporary Roads

Implementation of Alternative 2 would require construction of temporary roads totaling 8.5 miles (23 ac of road bed) to support commercial thinning operations. Temporary roads shall be constructed to meet 9 standards listed below, to minimize disturbance and impacts to adjacent resources. Exceeding these standards would require engineering design for the temporary road:

- 1) Length no longer than 0.5 miles
- 2) Side slopes less than 40%
- 3) No Switchbacks
- 4) No blasting of rock
- 5) No End Hauling of Material
- 6) Grades less than 15%
- 7) No Wet areas to be crossed
- 8) No Stream crossings

No crossing on unstable slopes or soilsTemporary roads are not intended for mixed vehicle use (not open to the public), nor are they intended to remain as identifiable facilities after the administrative need for their use has ended. At the completion of harvest and post-harvest activities (treatment of activity fuels and underburning) all temporary roads would be barricaded to eliminate motor vehicle access and would be decompacted and/or recontoured as part of post-harvest soil remediation activities to facilitate their return to vegetative productivity. Temporary roads would be seeded unless the adjacent plant community will provide a sufficient seed source for vegetative recovery.

Effects of temporary roads stem directly from compaction and resulting loss of infiltrative capacity, increased erosion potential, and dramatically reduced vegetative productivity. Compaction results in reduced aeration and drainage, as well as disruption to microbial populations that causes that reduced productivity and increased erosion potential (Elliot et al., 1999). Tree growth may be reduced adjacent to the compacted zone. Natural recovery from compaction can be variable, but in general the rate of natural, unassisted recovery is slow (Froehlich et al., 1985). These effects would be reduced by decompacting and/or recontouring so that they generally apply only over the short term – five years or less. Because of the moderate ground slopes and moderate infiltration rates of the soils adjacent to these temporary road beds, sedimentation effects would be localized to upland areas immediately adjacent to the roads.

Decommissioning Roads

Road decommissioning is defined as: “Activities that result in the stabilization and restoration of unneeded roads to a more natural state” (36 CFR 212.1, Forest Service Manual 7705 – Transportation System [USDA FS 2003]). Decommissioning entails 1) stabilizing and restoring unneeded roads to a more natural state using the methods described below(36 CFR 212.1); 2) re-establishing vegetation and restoring hydrologic and ecological processes interrupted or adversely impacted by the unneeded road; 3) management to block vehicles.

Under Alternative 2, 27.65 miles of road would be decommissioned, and no longer maintained. The long-term goal of road decommissioning projects is to reduce or eliminate hydrologic and sediment-related impacts so that instream conditions (i.e. substrate conditions and pool quantity and quality) may improve to natural conditions.

Under the proposed action decommissioning activities have been further defined by category of action. Method 1 decommissioning entails loosening roadbed 18" prior to placement of embankment, fill all ditches and remove all culverts according to culvert removal typical, scatter available vegetation. Method 2 decommissioning entails loosening roadbed 18" prior to placement of embankment, outslope 5% or greater than existing road grade up to max 20%, scatter available slash. Method 3 entails loosening the roadbed 12"-18", remove all culverts according to culvert removal typical and scatter available slash.

Cumulative Effects

Temporary Roads

Variable topography within the Project Area requires use of both ground-based and skyline yarding systems to remove logs to landings. Temporary roads have customarily been constructed to provide access to those landings that were within the interior of units or otherwise not immediately adjacent to existing portions of the transportation system. Older temporary roads that had not revegetated were added to the transportation system in the late 1970's in response to a directive that all existing wheel tracks be inventoried. With the advent of the requirement in 1976's National Forest Management Act that temporary roads be revegetated within 10 years, more attention has been paid to improving circumstances for revegetation on compacted temporary road surfaces, and within the last decade they have been aggressively treated for decompaction.

Under Alternative 1 - No Action, there would be no treatments and no temporary roads would be built. Previously constructed temporary roads and unauthorized roads that were not treated by soil decompaction and have not naturally recovered would continue to provide some effect to vegetative productivity, surface/groundwater hydrology, and sediment production, although the nature of the surrounding soil types would localize these effects. Such effects would slowly diminish as compacted roadbeds decompact.

Under Alternatives 2 there would be, over time, a baseline of untreated temporary roads having been constructed within the PLTA as individual units were harvested by various timber sales with a certain degree of erosion potential and reduced vegetative productivity. As both temporary and unauthorized roads were treated by various decommissioning actions, erosion potential would decline. The productive capability would increase over time as a natural soil profile is restored.

Road Use and Maintenance

The combination of past access management decisions to close roads in the area encompassed by the Swauk Pine PLTA, combined with proposed road closures, and any road/trail conversions that may take place, along with the anticipated new forest Travel Management Plan involving additional road closures or seasonal restrictions, would result in changes to the composition and increase in volume of vehicular traffic on roads within the PLTA, leading to a potential need for increased maintenance on those roads.

Implementation of Alternative 1 - No Action would mean that there would be no additional traffic added due to hauling activities and that there would be no additive need for construction, reconstruction, maintenance of haul routes.

Project implementation would have an additive effect from those changes and the increased traffic resulting from implementation activities on the maintenance needs of both designated trails and other open roads used as

haul routes. The performance of reconstruction and haul route maintenance requirements would lessen these effects and minimize impacts resulting from the increased road use occurring during implementation of vegetative management activities. Travel Management for the entire forest is expected to be completed by 2015. It would result in recommendations for “the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of National Forest System lands” (36CFR212.5).

Table 3.25. Resource Indicators and Measures for Cumulative Effects

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Alternative 2 (Units)	Past, Present, and Future Actions (Units)	Cumulative Impacts (Units)
Water quality	Sediment delivery	Number of trail stream crossings	56	8	64
Water quantity	Water yield	Trail density (mi/mi ²)	0.4	0.1	0.5
Riparian Function, and Channel Stability	Sediment delivery and streamside cover	Trail in riparian Corridor (miles)	11	1	12
Soil Stability	Soil Erosion	Trails on slopes greater than 15 percent grade (miles)	6.8	0.3	7.1

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Consistency Finding

No road construction would occur in Inventoried Roadless Areas.

The size of the Forest Service Road System would be reduced through a series of actions based on Travel Analysis.

Range _____

Introduction

The Swauk Sheep Allotment encompasses the entire Project Area. Under the approved 10-year allotment management plan, 1000 ewe/lamb pairs are grazed annually for a 93-day season (approximately June 10 through September 10).

This analysis focuses on effects of project on the rangeland resource. Proposed activities include mechanical thinning, prescribed burning, road management, and aquatic and riparian treatments. Actions are analyzed for their effect on forage, permittee access and livestock distribution, and socio-economic values associated with Swauk Sheep Allotment.

Regulatory Framework

Forest Plan Standards and Guidelines

A management goal of the 1990 Forest Plan is to develop, protect, and manage the range resource to maintain and improve vegetative conditions compatible with management area goals (Plan page IV-3).

Laws, Regulations, and Policies

The Multiple Use Sustained Yield Act of 1960 identified grazing as an important use of National Forest System Lands. The Public Rangelands Improvement Act (1978) reaffirmed the commitment to manage, maintain, and improve the condition of public rangelands.

Methods and Scale of Analysis

Effects on livestock distribution are analyzed for the period of project implementation (1-5 years). Grazing response to treatments is considered over a 3-7 year period following treatments. Effects on access are considered over the long-term (>10 years after treatments). Effects are analyzed at the Project Area and allotment scales.

Existing Conditions

The Project Area encompasses 14% of the overall allotment, (6195 ac), 13% of the key grazing routes (10 out of 49 miles) and 17% of the approved bedgrounds (12 out of 71). The permittee uses approximately 15% of the total permitted annual days (14 out of 93 days) in the Swauk Pine Project Area. The approximate grazing route through the Project Area totals 10 miles (2 parallel routes), and with use of side-roads, the total miles of road used to route sheep or access bed-grounds is 17 miles (21% of all road miles in the Project Area) (Table x). The total includes private and drivable ML1 roads. Approved bed grounds are also located on or near roads. There are no range structural improvements in the Project Area.

Table 3.26. Project Area roads used to route sheep on the Swauk Allotment.

Road Number	Current Management Level	Length	Number of Bed-grounds/Facilities Supported
9705*	3	0.59	1 Bedground/Routing
9705205*	1	0.54	1 Bedground
9711	3	2.11	2 Bedground/Routing
9712	3	0.61	1 Bedground/Routing
9712123	2	8.36	1 Bedground
9712215			1 Bedground
9712620			1 Bedground
9718	3	4.47	2 Bedground/Routing
9718210	1	0.29	1 Bedground
Total		x	

** indicates a road that is part of an alternative route which does not service much of the northeastern portion of the Swauk Allotment, but may be utilized to connect back to the FSR 9712 in the event the FSR 9718 must be completely avoided.*

Environmental Consequences

Direct and Indirect Effects

Alternative 1 - No Action

Vegetation

In the absence of action, vegetation would continue to grow towards a mature condition. Continued reduction in the intensity and spectral quality of the light below the canopy would suppress understory growth and survival of intolerant species (Freyman 1968, Solomon, Folliott and Thompson 1976, McLaughlin 1978, and Carleton 1982). Shade tolerant species would out-compete less shade tolerant species. Over time, trees would dominate, resulting in the associated shrubs, herbs and grasses becoming less abundant due to the corresponding increase in canopy cover and associated increased shading (Naumburg and DeWald 1999, Host 1988, McConnell and Smith 1970). Understory diversity and productivity would not only decline but also corresponding changes in plant community structure would also occur (Camp 1999, Moir 1966). Opportunity to increase the amount of transitory forage and browse would not be provided. Lack of management action would maintain the current vegetation condition across the landscape and consequently those conditions would lack transitory range and associated forage.

Permittee Access

Taking no management action would have no effect on permittee access to the Swauk Sheep Allotment, as there would be no vegetation treatments, road management, or instream restoration activities implemented under this decision. This option would provide current road access to bed-grounds and grazing areas. This alternative would not require modifications to the grazing operation, routing, relocation of associated bed-grounds, or deferment of grazing as a result of project activities.

Resource indicators and measures for the existing condition (Alternative 1) and post-project condition (Alternative 2) are displayed in Table 3.30.

Alternative 2- Revised Proposed Action

Required Mitigations for the Range Resource

- Annual operating and implementation plans for range use, invasive plant management, non-commercial thinning, prescribed burning, and riparian treatments would be coordinated annually, to reduce or avoid potential conflicts.
- Range permittees would be notified prior to herbicide application and applicable management practices would be followed.
- Ensure adequate access to grazing areas (using roads) in order to utilize as much of the allotment as possible and to minimize impacts to major road corridors.
 - When road decommissioning or reduction of ML to ML-1, is necessary, either adequate space at the road beginning (300') should be maintained or new area identified prior to action.
 - ✓ Must meet established bed-ground criteria.
 - When restoration work is performed in close proximity to authorized Route or bed-grounds (and avoidance is requested), adequate access (alternative Route and/or bed grounds) must be identified and provided in order to honor the ten (10) year Term grazing permit.
- Deferment of grazing for up to two seasons would be implemented prior to and following prescribed fire and thinning treatments to encourage vigorous seedling establishment.
- Coordination with the botanical resources regarding the protection of rare plants would occur annually.

Vegetation Treatments (Forage Response)

Alternative 2 proposes mechanical removal of forested overstory vegetation and/or burning of the associated understory vegetation. The direct effects of removing the overstory canopy are 1) a reduction in shade and a

corresponding increase in the intensity of direct sunlight reaching the forest understory and 2) a reduction in the number of vegetation layers and consequently, plant community structure. It has been well documented that thinning and/or removal of the forest component of dry forest ecosystems results in the stimulation of the associated understory component (Clary and Folliot 1966, Carleton and Maycock 1981, Host 1988, Lieffers and Stadt 1994, Agee (1994), Riegel et al 1995, Griffith 1996, Ricard and Messier 1996, Naumburg and DeWald 1999). In general, the research indicates that productivity of the understory vegetation is inversely related to tree density and directly proportional to the amount of solar radiation that reaches the understory vegetation. Studies also emphasize the importance of plant community structure characteristics such as tree size and spacing in understory productivity (Camp 1999, Naumburg and DeWald 1999, McConnell and Smith 1970). The research indicates that increased productivity is positively correlated with larger trees and wider spacing. The indirect effect of increased plant productivity is an increase in forage and browse that is available for grazing by permitted livestock.

The effects of prescribed burning on forest understory and inter-mingled shrub and grassland communities would vary based on pre-treatment species composition and the adaptive strategies of individual species (Crane et al 1983, Agee 1994). Typically understory species associated with dry forest plant communities are either tolerant of or enhanced by low and moderate intensity fire (Agee 1993). Arno (1999) observed increases in species such as Oregon grape, Scouler's willow, pinegrass, elk sedge and Ross' sedge following thinning and burning in dry forest vegetation types. Both rose and snowberry retained their pre-treatment abundance, while species such as bitterbrush and kinnikinnick showed a slight overall decline in post-treatment abundance. Owens (1982) indicates that the degree of shrub regeneration is directly associated with the amount of overstory mortality resulting from the fire. The intensity and timing of the burn treatment can significantly affect the degree to which individual species respond. For example, bitterbrush can be eliminated by high intensity fire during late summer and fall and burning during the fall may substantially increase buckbrush (Brown and Debye 1989, Blaisdell 1950, Bradley et al 1992). However, based on this proposal, it is anticipated that prescribed burning will function to enhance the understory vegetation relative to plant vigor, productivity and diversity and consequently; to an increase in forage and browse available for grazing by permitted livestock.

Deferment of Livestock Grazing

Mechanical removal of forested overstory vegetation and/or burning of the associated understory vegetation would present some degree of risk in terms of logistics and safety with respect to project implementation. To avoid the potential for conflict in areas where active timber harvest, prescribed fire operations or restoration treatments occur concurrently with domestic livestock grazing, it would be necessary to defer livestock grazing. Driving livestock past and/or avoiding proposed activity areas to relocate them to non-activity areas could result in a loss of grazing opportunity. Ultimately, this could result in an overall reduction in available forage and season of use in the short-term. The actual timing of implementation of individual activities or combinations of activities would ultimately determine the extent of the effects and the specific areas requiring modification or deferment in the annual grazing instructions. Given the most extreme situation with respect to timing of implementation and specific activity areas, there could be a complete loss of use of the allotment during the period of project implementation (up to 5 years).

Temporary modification or deferment of grazing activities during post project implementation may also be necessary to mitigate potential adverse effects resulting from livestock grazing areas that have been prescribed burned and/or seeded with the intent of preventing noxious weed infestation. Grazing these areas immediately following seeding and/or during the early stages of seedling establishment has the potential to inhibit the

successful revegetation of the site. Typically, a maximum of two years restriction on grazing in these areas is adequate (Wright & Bailey, 1980).

Invasive Plant Treatments

The effects of the proposed invasive plant management on range operations and management, include: 1) In the short-term, livestock permittee and livestock could come into direct contact with invasive plant control activities. Invasive plant management activities have the potential to interrupt grazing and the ability to accomplish annual grazing objectives with respect to utilization of specific areas within the allotment. Grazing of livestock through invasive plant management activity areas could interfere with implementation of effective prevention and control. 2) Over the longer term, treatment of existing invasive plant infestations could improve forage conditions on degraded sites and enhance the quality and quantity of desirable forage and, ultimately, the grazing capacity of the livestock allotment.

Implementation of the Refined Proposed Action would result in limited isolated impacts to the permittee with respect to the annual grazing strategy; as treatment locations are contained and do not occur large-scale across the project area. Areas targeted for treatment would be avoided through permittee notification and responsive livestock distribution. In addition, the timing of herbicide application would be coordinated to avoid conflict with livestock grazing activities (as per label instructions-Design Criteria #1). The avoidance of target areas through livestock distribution would also minimize or eliminate the potential for a reduction in the effectiveness of the treatment resulting from livestock grazing through invasive plant treatment areas.

Implementation of the Refined Proposed Action would result in little to no risk to livestock permittees or livestock. The implementation of the required standards and design criteria with respect to notification, coordination, and herbicide application requirements would result in little to no likelihood that the permittee or livestock would come into direct contact with herbicides or their residues. Standard #12 ensures timely public notification, including permittees. As well, Standard #12 requires posting to inform the forest visitors of application dates and herbicides to be used. Further, Design Criteria #5 requires range permittees be notified in advance of planned spray dates to coordinate implementation and reduce potential adverse impacts to permittees and livestock. These standards and design criteria have been/continue to be highly effective in minimizing or eliminating the likelihood that the permittee or the livestock would come into direct contact with herbicides or their residues.

Permittee Access and Livestock Distribution

Many roads existing within the Swauk Pine Restoration project area provide permittee access to authorized grazing areas. The Travel Analysis process indicated that of 81.85 roads identified in the project area, 16.96 are utilized by the range permittee for access to the allotment within the project area. Proposed road management activities would have a low impact on permittee access and livestock distribution, unless the two drainages (Lion and Cougar Gulch) are receiving treatments concurrently and require complete avoidance (See Cumulative Effects below).

The Refined Proposed Action (Alternative 2) would reduce the permittees' current road access by three percent (3%).

With respect to indirect effects, modifications to route and bed-grounds may result in increase in impacts, overlap and conflicts with other recreational users and Forest Service activities where routing and bedding of domestic sheep had not previously occurred.

Prescribed Fire, Aquatic & Riparian Treatments (Forage Response, Access& Distribution, and Socio-Economic)

Proposed use of prescribed fire and aquatic & riparian restoration treatments would impact the permittee through deferment or relocation of routing and bed-grounds. For the purposes of this analysis, the minimum estimated loss in use is 3 bed-grounds and 6 days (assuming only one drainage would be treated at a time in any given season and timing will be such that periods of avoidance would not overlap).

Cumulative Effects

In the short term (1-5 years), this action, in combination with other ongoing and reasonably foreseeable actions within the allotment restricts would restrict use of the allotment by the permittee. The project would result in additional modifications (e.g., deferral and rerouting) to the current grazing plan. Multiple modifications resulting from multiple projects (e.g., fuels, Invasive Plant treatments, recreation, wildlife management, travel management) occurring at the same time restrict the area and season of use available for livestock grazing. While effects such as deferment of grazing and rerouting are typically short-term in nature; other effects such as loss of routing and associated bed-grounds are very long-term (permanent). Although the immediate area of analysis is the Swauk allotment, this condition is becoming prevalent across allotments over the entire south range zone, further reducing the overall grazing capacity in the short-term. In the longer-term (2-7+) years, the proposed action in combination with vegetation management previously approved and being implemented would result in an improvement in plant productivity and an incremental amount of forage and browse available to livestock at the allotment scale, ultimately improving the overall allotment condition and livestock production capacity, as well as the capacity of the south range zone.

In the event that burning and aquatic restoration treatments occurs on the entire project area at once, both the Lion (9712) and Cougar (9718) Gulch roads, deferring use of those roads has the potential to eliminate the only access to the eastern half of the Swauk Allotment, which is approximately 23,000 acres, and approximately 40% of bed-grounds and permitted days. Planning efforts should be made ensure access to 9718 is maintained at a minimum with the option to trail through the treatment areas (about a 5-mile journey).

Table 3.30. Comparison of range resource indicators under alternatives 1 and 2.

Indicator	Measure	Alt 1	Alt 2
Access & Distribution	Number of bed-grounds	12	9
	Number of facilities	0	0
	Routing (miles)	9.67	5
Forage Response	Acres of forage improved	0	6,589
Socio-Economic	Number of livestock (ewe/lamb pair)	1000	1000
	Season of use (Days)	14	7

Consistency Finding

The Swauk Pine Restoration project is consistent with all required laws, regulations and policies, including: The Multiple Use Sustained Yield Act of 1960, The Public Rangelands Improvement Act (1978), and the Okanogan-Wenatchee National Forest Land and Resource Management Plan (1990). The Swauk Pine project

recognizes grazing as an important use of National Forest System lands and reaffirms the commitment to manage, maintain, and improve the condition of public rangelands. In the short-term, this project maintains use of the allotment and in the longer-term enhances opportunities for range management.

Recreation

Introduction

The Project Area provides a variety of year-round recreational opportunities, mostly on associated system roads and 4X4 jeep trails near the town of Liberty. Recreational uses include mushroom picking, Christmas tree cutting, rock hounding, 4X4 trail use, motor-touring to view scenery and wildlife such as elk, birding, hunting, dispersed camping, and snowmobiling.

Local users include residents of the town of Liberty, private landowners in and around the Project Area (including Liberty Mountain Owners), and residents of nearby towns and cities (Cle Elum and Ellensburg). Many other visitors travel here from urban areas on the west side of the Cascades. The road system can also be used to access popular destinations outside of the planning area boundaries, such as Table Mountain.

Potential impacts to recreation stem from proposed changes to the road and trail system, removal (decommissioning) of unauthorized roads and trails, temporary closures of roads and trails during treatments, and modifications to existing dispersed campsites. The indices used to measure and evaluate effects to recreation include miles of open road that would be closed or decommissioned, miles of closed road that would be decommissioned, miles of unauthorized road and trail to be decommissioned, net change in miles of 4X4 trail, number of dispersed campsites that would physically modified, and number of dispersed campsites that would incur loss of motorized access due to planned road actions.

Regulatory Framework

Forest Plan Standards and Guidelines

- Standard RM-2 is specific to recreation: Adjust dispersed and developed recreation practices (in Riparian Reserve) that retard or prevent attainment of 9 Aquatic Conservation Strategy Objectives (ACSOs) listed in the 1994 Northwest Forest Plan Record of Decision (page B-11).
- A 1990 Forest Plan goal is to provide a well-balanced array of recreation opportunities across the breadth of the recreation opportunity spectrum in accordance with resource capability, public demands, and expectations for outdoor recreation (1990 ROD page 7).
- The 1990 Forest Plan (page IV-65) requires road and trail design to be consistent with the adopted Recreation Opportunity Spectrum (ROS) class and Visual Quality Objectives (VQOs) indicated by management prescription. VQOs are addressed in the next section.

Laws, Regulations, and Policies

Forest Plan standards and guidelines are designed to ensure conformance with the Multiple Use Sustained Yield Act, enacted by Congress to ensure that national forests are administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes.

Methods and Scale of Analysis

All known travel routes within the Project Area were mapped in the field with Global Positioning System (GPS) devices. Existing dispersed campsites were noted during general field reconnaissance. Effects were analyzed over the short-term (during project implementation), and long-term (>5 yrs post-project).

Existing Conditions

Dispersed Camping

There are no developed (constructed) Forest Service campgrounds or picnic sites within the Project Area. The closest developed campgrounds are Swauk Campground (located at Highway 97 milepost 160), Mineral Springs Campground (at Highway 97 milepost 156) and Ken Wilcox Horse Camp (FSR 9712 on Table Mountain). People who camp in the Project Area pull off one of the Forest Service system roads and set up camp among the trees. There are several dispersed camp areas (camping areas without facilities) adjacent to roadside pull outs. The Forest Service does not create these roadside camp areas which typically consist of a place to park and a user built rock fire-ring. Roadside dispersed camping may occur in any location suitable for pulling off the road and setting up a camp, as long as existing vegetation is not damaged. This dispersed camping is especially popular during general firearm hunting season in October, or with groups looking for a place where everyone can pull multiple vehicles together, or for those that are seeking free camping. Most of these campers stay in some sort of recreational vehicle, although some stay in tents. These sites range in size from areas that fit a single car and tent to larger spots where multiple users may park vehicles and camp. Campers build and use rock fire rings, although there are often campfire restrictions by July within this ranger district.

There are approximately 30 identifiable dispersed camping sites in the project area, however only about 20 of them appear to be used on a regular basis. If not directly on the road's edge, sites include an access route leading to a parking area with little to no ground vegetation and a campfire ring.

The campsites are small - generally less than one acre. The combined acreage of the 20 most used sites is approximately 25 acres (ocular estimate), scattered along the main roads. During general firearm season, in October, perhaps 80% of the existing sites are used, with occasional new ones becoming established. For the majority of the summer, approximately half of the sites are full on weekends.

The amount of area used for dispersed camping is increasing slowly over time as the number of people coming to the project area increases. Without precise counts possible and using statewide calculations, the number of people recreating in the project area may be increasing at a rate of approximately 5% per decade for the past 30 years (Interagency Committee on Outdoor Recreation 2003). Most people have their "favorite spots" and camp there year after year. If their spot is taken when they arrive, they generally move to another spot, or make a new one.

The Interagency Committee on Outdoor Recreation for Washington State estimated that, by 2014 there would be a 5% increase in the number of people camping in dispersed sites, but a 15% decrease in the number of people hunting (Interagency Committee for Outdoor Recreation, 2003). Since the most concentrated use period in the dispersed campsites is during hunting season, the overall number of people using dispersed sites will likely remain constant, or increase less than the potential 5% overall. During general firearm season, there will be a gradual decrease in the number of people in the project area, and the number of people using dispersed campsites. Outside of hunting season, the estimated increase in the number of people will not exceed the capacity of the existing dispersed sites.

The structure of the forest influences the size and location of the dispersed campsites. Surrounding trees and vegetation limit the size of existing sites, and new sites are generally established only in open stands where people can drive a vehicle off a roadway to a clearing in the forest. Currently the regulations that place limitations on people driving off an existing road to establish or new campsite would be Forest Service regulations against damaging forest resources.

System Trails

Summer Trails

This area is of particular interest and a state-wide destination for 4X4 enthusiasts because it offers a large system of connected trails that provide for extended trail travel. All of these trails are designed and maintained for short wheel-base four wheel drive (4WD) vehicles such as jeeps. Users can find different levels of difficulty.

There are no non-motorized trails managed solely for hiker/horse use within this Project Area. Also, there are no Forest Service system single-track motorcycle trails. Jeep trails are open to hikers, motorcycles, ATVs and horse use. Much of the jeep trail maintenance is accomplished by volunteer groups working with the agency.

The Project Area encompasses 8.4 miles of Forest Service 4X4 jeep trail:

- Trail #4W334- Hole in the Rock Trail- following road 9718 approximately 2.5 miles north past the town of Liberty. Trail starts on a very sharp left switchback. Approximately 2.8 miles in length. Trail ends on an old Forest Service Road, spur #622.
- Trail #332- Lion Gulch Trail- Starts and ends on Forest Service Road#9712-113. Approximately 3.2 miles in length.
- Trail #4W339- Billy Goat Gulch approximately 2 miles in length. Trail starts off of Forest Service Road 9712 approximately 5 miles from the town of Liberty, just before the junction with Forest Service Road #9718.

Due to potential impacts to wet ground, there is a yearly District-wide motorized trail system closure until June 15th. If earlier dry conditions and completed trail maintenance allow, however, then trail segments may be legally opened by trail managers prior to June 15.

Within the last 10 years, the Cle Elum Ranger District had designated a few roads in the Williams Creek watershed (immediately adjacent to the Planning Area), as “dual-use” Forest Roads; a designation allowing OHV motorized riders to share the road with passenger vehicles. The Lion Gulch and Harkness/Pine Gulch roads (FSR 9712 and FSR 9726) were designated as connecting routes between camping areas and system trails, open to both OHV vehicles and cars. However, after repeated incidents of off-road riding in meadows and illegal hill climbs, the Forest Service rescinded these designation.

Off-road motorized travel is an on-going concern in the Project Area. Cross-country travel by motorcycle, ATV, and 4X4 vehicles has damaged soil and groundcover characteristics on moderately steep slopes adjacent to dispersed recreation sites along the Riparian Reserve of Lion and Cougar Gulch, and Williams Creek and areas adjacent to forest roads and motorized trails.

Winter Trails

There are also 18 miles of groomed snowmobile trail (FSRs 9712 (Lion Gulch), 9718 (Cougar Gulch), and 9705 (Durst Creek)). Snowmobile grooming begins each year on or around December 1st and ends around March 31st, if snow conditions allow. Groomed routes are heavily used, primarily by snowmobilers. A small amount of cross-country skiing and snowshoeing also occurs.

Environmental Consequences

Direct and Indirect Effects

Alternative 1 - No Action

If no action is taken, there would be no change in existing recreational uses of the area. Use of existing dispersed campsites would continue without modifications to footprint or access routes. The footprint of disturbance for larger sites along Lion Gulch Creek would likely increase over time, due to lack of defined access routes, parking areas, and campsites. Motorized access to smaller campsites in Lion Gulch would also continue, and without maintenance, these user-built access roads are likely to become rutted and expand as users attempt to avoid ruts. The risk of sediment delivery and impacts to riparian vegetation would continue to rise. See effects under Hydrology.

Road densities would remain high. Access for both winter and summer recreation would remain at a high level. Visitors to the area may encounter increasingly degraded road surfaces, however, due to declining road maintenance budgets and an expanding backlog of deferred road maintenance work. Only the main arterial roads are likely to be maintained on a regular basis, and even then, it would be commensurate with budgets.

System jeep trails would not be relocated. Three steep and eroding sections of 4W339 are not sustainable in their current locations, and failures are inevitable. This typically results in user-built “work arounds”, and clusters of poorly designed duplicate trails in sensitive locations.

Alternative 2 - Revised Proposed Action

Dispersed Camping

Planned modifications to 4 dispersed campsites (Fig. 13 in EA Chapter 2) would result in the following changes in use:

After planned decommissioning of the unauthorized access route at recreation site no. 26, campers would be required to walk in less than 100 feet from the shoulder parking area on FSR 9712, to the existing dispersed campsite. Use of this campsite would likely change from RV camping to tent camping.

At restoration site no. 46 (often used during hunting season), the footprint of the existing campsite would be reduced by approximately one-half, and the unauthorized motorized trail that crosses Lion Gulch Creek (user built) would be barricaded and restored. Use of the campsite would continue, but capacity to accommodate vehicles may be reduced.

At site no. 91, 300 feet of ridgetop unauthorized road between the shoulder of FSR 9705 and an existing campsite would be retained as a footpath. Unauthorized road beyond the campsite, however, would be decommissioned. Use of the campsite would not be restricted.

At restoration site no. 1, the campsite footprint would be reduced by 1/3rd. Vehicle parking would be on the road shoulder of FSR 9718 would be defined and use of the campsite would continue.

Motorized access to 5 other dispersed campsites would be curtailed by planned decommissioning of system and/or unauthorized roads or closure of system roads (Fig. 14). In all cases, a short parking spur would be maintained on the road shoulder, and road decommissioning would be designed to leave a foot trail to the existing campsites. Use of campsites would not be prohibited—only motorized access.

Summer Trails-

Planned commercial thinning and underburning may result in a more open forest condition that increases the potential for damaging off-road use. Risk of unauthorized summer off-road travel would be addressed by plans for higher retention of trees, vegetation, and/or brush in the designated Hill-climb Restoration Area.

The Hole in the Wall Trail (4W 339) would no longer descend steeply from Lion Gulch Ridge into the Riparian Reserve of Lion Gulch Creek and then climb back up to the ridge again. Instead, it would remain on the ridge, utilizing a new section of road built for timber haul, and then converted to trail by narrowing and roughening the road to create a jeep trail experience. The net effect of the trail relocation would be establishment of a system trail in a sustainable location, without the loss of connection to the existing loop opportunity.

Further south, 4W 339 would descend from the ridge and connect to what is now FSR 9712113 (a dual use segment), using a new and more sustainable alignment that would not deliver sediment directly to a stream crossing at the bottom of the slope. The net effect of this trail relocation would be a sustainable alignment that would still connect to FSR 9712113, would no longer be dual use but would be added to the jeep trail system and maintained as a jeep trail. The loop opportunity provided by 4W339 and 4W332 would be maintained.

Temporary Trail Closures

Some sections of 4W339, 4W334, and 4W332 may be temporarily closed to public use during active harvest and/or prescribed burning operations. The commercial thinning contract may extend up to 5 years, and the order in which areas are treated is determined by the Purchaser. The Forest Service Timber Sale Administrator would work with the purchaser, however, to block up treatments and minimize disruptions to other Forest users, as much as possible.

System jeep trails used as fireline (including 4W 332) would be closed to public travel for perhaps several days during burning operations, which typically occur on other than weekends and holidays. In some cases large pieces of wood debris adjacent to the trail would not be burned, if they help to restrict vehicle traffic to remain on the trail tread. Planned use of system jeep trails as fireline during burning operations would have no long term impacts to the trails.

During logging, several jeep trail segments would be used for short durations to either yard logs out of a unit, or for trucks to haul the logs out of the woods. For public safety, these jeep trail segments would be closed to public use or travel during operations, as follows:

- A short segment of jeep trail 4WD 339, where it also a FSR 9712619, would be closed to public access when a yarder is set up on the trail near Unit #23. This would be of short duration, likely less than two weeks. The trail would be signed closed, then reopened when equipment is removed. If necessary the trail tread would be restored by the purchaser. Two other trail segments (in the vicinity of Unit #20 and Unit #34) would also be used for timber haul. Closure could last up to 2 months. Any changes to the trail tread would be restored by the purchaser.
- During the time that illegal hill climbs are closed and restored, near units 35, 36, 37, 39, a section of 4W339 would also be temporarily closed. Duration of this trail closure could last several years (potentially for the duration of the timber contract), because the wood slash needed to restore hill-climbs would be generated by thinning.
- A short segment of jeep trail 4WD 334 would be closed during yarding and hauling from Unit #29, with an expected duration of less than one month. During that time, the trail would be drivable up to the point of closure, and then jeeps would have to turn around and retrace their route, rather than complete a loop.

Winter Trails

Several forest roads designated for timber haul are also groomed snowmobile trails. The operator would not be allowed to operate on Saturdays and Sundays to accommodate weekend snowmobile use of those roads/snowmobile trails. During weekdays, the logging contract would be written to require retention of enough snow depth on plowed roads to allow continued snowmobile use on weekends.

Cumulative Effects for Alternative 2

The Okanogan-Wenatchee National Forest is scheduled to complete the Travel Management environmental analysis and issue a decision by the end of 2016. The decision is expected to change access to National Forest System land from “open unless designated closed” to “closed unless designated open”. The initial Forest-wide decision is not expected to address any specific changes to the road and trail system. Those kinds of decisions would be made later by ranger districts, following site-specific environmental analyses.

When Travel Management is first implemented, motorized vehicles, including ATVs/OHVs and motorcycles would only be allowed on routes designated open to motorized travel. Cross-country travel would be prohibited, as would any motorized travel on roads not designated open. Although off-road motorized use is heavily discouraged, current policy only prohibits the resource damage resulting from off-road use, and both damage and culpability have to be proven in a court of law. (OHV travel may also be prohibited by legal closure order). If and when enacted, the new Travel Management Policy would make it illegal to drive off-road, and provide an additional enforcement tool in ongoing efforts to eliminate damaging off-road use and hill-climbs.

Consistency Finding for Recreation

The Project Area would continue to provide a wide variety of recreational opportunities, as envisioned under the 1990 Forest Plan.

Mining

Introduction

Swauk Creek watershed boasts a rich and continuous mining history, principally for gold, that began in the late 1800s. Gold is found here in various forms (native gold in parent rock, placer nuggets in gravel and wire gold). Mine sites are generally small and usually do not exceed a tenth of an acre. The operators are miners, prospector, individuals, clubs, or companies that conduct mineral prospecting, exploration, or other mining activities under the authorities of 1872 Mining Law as amended (Mining Law).

On an industry scale, mining in the project area is predominantly prospecting and exploration, commonly consisting of suction dredging, panning, bulk sampling and underground exploration. Seasonal camping is frequently associated with these operations.

The Project includes decommissioning of system and unauthorized roads that may be used by individuals working under the Mining Law. Removing vehicle access through the decommissioning of roads can have direct effects on mining activities. Vegetation treatments may also impact mining activities. The indices for evaluation of project effects are the miles of road potentially used for mine access or minerals exploration that would be closed or decommissioned, and the potential for temporary disruption of mining due to vegetation treatments.

Most of the land within the Swauk Pine area is Public Domain and open to the Mining Law. However there are parcels of land in the project area that are not Public Domain therefore not subject to 1872 Mining Law. Other authorities may apply to these lands.

Regulatory Framework

Forest Plan Standards and Guidelines

- The Forest Plan recognizes the public's right to explore for, develop and produce mineral resources, and encourages orderly mineral exploration, development and production activities (LRMP page IV-98).
- Requires that mining activities be conducted in compliance with the 36 CFR 228 regulations and Federal and State standards for air quality, water quality, solid waste disposal and treatment, threatened and endangered species, cultural resources, and fire (1990 Plan page IV-98).
- Mining activities are expected to be reasonably incident to exploration, development or production.

Laws, Regulations, and Policies

Mining rights were a concern raised during scoping. Mining laws were important to the development and disposal of federal lands in the Western United States. Three key laws frame mining activities in the Project Area, as follows:

General Mining Law of 1872, as amended (30 U.S.C. 21-54) confers a statutory right of citizens of the United States, and those people with intent to become citizens, to enter public lands to search for minerals. A mining claim is the beginning of a land right, once a miner has made a discovery. The claim protects the miner's discovery from other interest parties. It is not necessary to have mining claim to prospect.

The Organic Act of 1897 established the right of the Federal Government to create regulations to manage surface uses on the national forests. This includes activities conducted by those working under the Mining Law.

The Multiple Use Act of 1955 (30 USCS Section 612 (b)) further defined the right of the Federal government to manage the surface resources on the national forests. That law states that "Rights under any mining claim hereafter located under the mining laws of the United States shall be subject, prior to issuance of patent therefore, to the right of the United State to manage and dispose of the vegetative surface resources thereof and to manage other surface resources thereof....".

Under federal regulations, miners operating on National Forests shall "to the extent practicable, harmonize operations with scenic values, take measures to maintain and protect fisheries and wildlife habitat, and construct and maintain roads in a manner that will minimize or eliminate damage to soil, water, and other resource values" (36 CFR 228.8). The regulations (36 CFR 228.4(a)) also state that if significant impacts to the environment occur the District Ranger can require a Plan of Operations (Plan). If mining activities do not cause impacts to the environment a Plan is not required.

Under 36 CFR 228.12, an operator (miner or prospector) can through a plan of operation, request authorization to use closed roads or unauthorized roads or construct new roads for mining activities. When a miner or prospector is using a system road in the same manner and intensity as other forest users and no new impacts occur, no authorization is needed for the use of the road.

Reasonable access is discussed in the Forest Service Handbook (FSH-2809), and varies according to the level of mining activity, defined in FSH-2809.15-12. The logical sequence for mining activities consists of

prospecting, exploration, development, mining, and reclamation. For details, see the Mining Specialist Report. In prospecting stages, reasonable access requirements can often be met by using existing system roads and trails or walking into sites.

Methods and Scale of Analysis

Information for mineral activities in the Swauk Pine area is based on field observations, aerial photography and global position system data collected between the years 2005 and 2015.

Minimum Roads Analysis entails rating the risks to the environment and benefits to the public for all roads within a Project Area. Environmental risk ratings are based on all uses of the road—not just those associated with mining. Roads used for mineral prospecting, exploration, and mining activities in the Swauk Pine Project Area were rated for Mining Benefit, as follows:

- High:
 - Used by operators authorized for the road use under previous decisions and include road obliteration at the end of the mining operations in the reclamation plan and reclamation bond. Previously unauthorized roads and new roads are authorized under a Plan and designated as Non-system Roads.
 - Used by operators who have filed a proposed Plan (separate Decisions) and may include unauthorized roads for access. Unauthorized roads would become authorized with the conditions that the unauthorized roads would be decommissioned at the end of the mining operation and the cost included in the reclamation bond. Those roads would become Non-system Roads for the duration of the authorized mining operation.
- Moderate:
 - Operators who hold mining claims but are not currently working the claim, and active mining operations, including those who do not have active mining claims. These operators have the option of submitting a proposed Plan that includes use of unauthorized roads identified for decommissioning.
- Low:
 - No active mining claims, no know mining prospecting/exploration, or land not subject to the 1872 Mining Law.

Existing Conditions

At this time, there are approximately 70 active mining claims in the Project Area. The number fluctuates, however, because existing claims may be closed or sold and new claims located at any time. Impacts to unknown operators cannot be assessed, but all known mining uses were considered.

Activities in the Swauk Pine Project Area are at the prospecting and exploration levels. There are (at the time this report) three authorized mines and six mines awaiting authorization, pending environmental review of their proposed Plans of Operation.

Operations consist of surface or underground prospecting or exploration. Prospecting and exploration includes hand tools and suction dredging. Camping is commonly associated with mining operations. One pending operation includes the processing of ore that is compatible with the exploration phase of a mining operation. There are some operations out of compliance with the 36 CFR 228 regulations due to the use of earthmoving equipment and/or impacts to riparian areas. Noncompliance issues are managed under the 36 CFR228

regulations by the District's Minerals Program. The Mining Specialist report lists mining activities documented at each mine site.

Only 2 mine sites have structures pending authorization (other than portal structures needed for safe ingress and egress from underground mines). Some operators have not stated what roads they prefer to use when accessing their mine sites. Rather than assume a specific route all potential alternate routes were rated for their mining benefit during Travel Analysis.

Roads located within the Swauk Pine area were identified for environmental impacts based on current use by all forest users and is not necessarily impacts solely associated with mining. Ratings for mining use of the road is based on the roads identified in authorized and pending Plans and existing operations. Roads with a low rating are not in areas with mining activity or active mining claims and decommissioning will not have any impacts on the mining activities.

There are approximately 38 miles of open roads (including 1.4 miles of dual use road/trails), that can be used by operators for access to their mine sites. Authorization for use of existing open roads is not required provided the use of the road is consistent with the average visitor and does not cause significant impacts to the road.

Authorized Mining

There are three mining projects that have authorized Plans of Operation within the Project area (See Table 3.31). One entails use of Non-system Road (with authorized use) for the duration of mining authorization. The operator has posted a reclamation bond, to ensure final decommissioning when mining is done.

Another authorized operation is a placer mine with reclamation pending. There are no roads that would be affected by the Swauk Pine Restoration Project.

The third approved operation is for underground mining with use of existing system roads (including 2 closed (gated) segments. The miner has been issued a key to go behind the gate). He also uses 3 unauthorized roads totaling 0.23 miles that are proposed for decommissioning under this project. These roads were not identified in the authorized Plan of Operation and are not included in the reclamation bond. The operator does have the option to modify his Plan of Operation to include these roads. If use is authorized, the road is reclassified as Non-system road with authorized use, for the duration of mining.

Table 3.31. Authorized mining activities and associated use of unauthorized roads. Only unauthorized roads would be affected by this Project, therefore individual road numbers and lengths, and mining ratings are included only for the unauthorized road segments.

Mine	Road Number	Mine Rating	System Road	Non-system	Unauthorized
POO-1993-OKW-CLE9302	9712125-0.07R-1	H			0.05
	9712127-0.07R-1	H			0.09
	9712127-0.19L-1	H			0.09
		TOTAL	0.74	0.00	0.23
POO-2015-OKW-CLE9605		TOTAL	10.50	0.16	0.00
POO-2008-OKW-CLE0806		TOTAL	0.00	2.37	0.00

Pending Mine Operations

There are currently 6 proposed mining projects (pending) in the Project Area (Table 3.32). These proposals are awaiting environmental analysis and decisions. Authorization would likely require reclamation of all improvements, disturbed ground, and non-system roads and trails used for access. A bond of sufficient funds to conduct the reclamation would likely be required.

Some unauthorized roads and unauthorized trails identified for decommissioning under this project are proposed access routes under pending plans. As required mitigation to reduce potential impacts of road closures on miners awaiting approval of their plans, no action would be taken on these roads under the Swauk Pine Restoration project until environmental review of mining plans have been completed and miners accept responsibility for these roads.

Table 3.32. Proposed mining activities (authorization pending) and associated use of unauthorized road that are proposed for decommissioning under Swauk Pine. Only unauthorized roads would be affected by this Project, therefore individual road numbers and lengths, and mining ratings are included only for the unauthorized road segments.

Mine	Road Number	Road Rating for Mining	System	Non-system	Unauthorized
NOI-1995-OKW-CLE9504	9718602-0.50L-1	H			0.21
	UAT16	H			0.77
	UAT17	H			0.16
	UAT18	H			0.07
	UAT19	H			0.02
	UA366	H			0.22
		TOTAL	8.09	0.13	1.45
NOI-2001-OKW-CLE0203	9718602-0.50L-1	H			0.21
		TOTAL	8.09	0.13	0.21
NOI-2005-OKW-CLE0510	9718000-1.38-2	M			0.14
	9718000-1.38L-3	M			0.03
	9718118-1.00L-1	H			0.23
	9718118-1.00L-2	H			0.09
		TOTAL	5.17	2.37	0.49
NOI-NPO-2011-OKW-CLE1111		TOTAL	0.32	2.61	0.00
UAO-2011-OKW-CLE1113		TOTAL	6.78	0.00	0.00

Other Mining Activity

There are 5 known mining operations in the Project Area that are not under approved Plans of Operation and that have not submitted plans of operation (Table 3.33). Three of the five are using unauthorized roads that would be decommissioned under this Project.

Table 3.33. Swauk Pine – Other mining activity and associated road use (if known). Only unauthorized roads would be affected by this Project, therefore individual road numbers and lengths, and mining ratings are included only for the unauthorized road segments.

Mine	Road Number	Mine Rating	System	Non-system	Unauthorized
NOI-1995-OKW-CLE9504	9718602-0.50L-1	H			0.21
	UAT16	H			0.77
	UAT17	H			0.16
	UAT18	H			0.07
	UAT19	H			0.02
	UA366	H			0.22
		TOTAL	8.09	0.13	1.45
NOI-2001-OKW-CLE0203	9718602-0.50L-1	H			0.21
		TOTAL	8.09	0.13	0.21
NOI-2005-OKW-CLE0510	9718000-1.38-2	M			0.14
	9718000-1.38L-3	M			0.03
	9718118-1.00L-1	H			0.23
	9718118-1.00L-2	H			0.09
		TOTAL	5.17	2.37	0.49
NOI-NPO-2011-OKW-CLE1111		TOTAL	0.32	2.61	0.00
UAO-2011-OKW-CLE1113		TOTAL	6.78	0.00	0.00

Environmental Consequences

Alternative 1 - No Action

Direct and Indirect Effects

Mining Access

Under the No Action alternative no unauthorized roads would be obliterated under this project. Access for miners and prospectors would not change. The 36 CFR 228 regulations would still apply to the use, construction, reconstruction, or maintenance of a road or trail and authorization for those activities is still under the authority of the District Ranger. Authorization of system roads would only be required if the road use by the miner or prospector were in excess of a typical forest user and resulted in significant impacts.

Temporary Disruptions to Mining

There would be no disruption of mining due to timber harvest, fuel treatments, or aquatic restoration actions. The risk of catastrophic fires would persist, and should such an event occur, it may result in short- or long-term loss of access to some mining areas. Danger tree management would continue, but at levels commensurate with a limited budget. As result, roads may be blocked at times, impairing access to mining areas. Prospecting and mining operations causing significant impacts to the environment would still require authorization under a Plan of Operation.

Alternative 2 (Revised Proposed Action)

Direct and Indirect Effects

Mining Access

One open system road used for mining access would be closed. Operators can request access on closed system roads. If their use would require road maintenance or mitigations, authorization through a Plan would be required.

One open system road used mining would be permanently relocated. The new road would still access the mining claim.

Some unauthorized roads with High or Medium ratings for mining value are identified for decommissioning under this project. At any time, these roads could be authorized for mining use through a Plan of Operation (with required mitigations), to reduce or eliminate environmental impacts. Use of the road, however, must be essential to the logical sequence of a mining operation, described above.

Impacts from other Project Activities

Use of Timber Haul Routes

There are 3 mine sites outside the project area that utilize a System Road (9700162) identified as a haul route. Miners may experience brief delays in use of these roads for mining access during periods of active harvest and timber haul.

For actions within the Project Area, effects from harvest operations and timber haul on miners will be the same as effects to all forest users. A previous project (Liberty Fuels Hazardous Fuels Reduction) did have project activity occur in close proximity to active mining and prospecting. There were no documented conflicts between mining operations, timber harvest activities, or the subsequent proscribed burning. Any conflict with miners who use timber haul routes for access would be short duration.

Physical Effects from Treatments

In commercial thinning areas, the timber contractor would be responsible for preventing direct impacts to mine improvements, equipment, supplies, structures and claim markers.

Riparian Large Wood Replenishment treatments may impact panning or suction dredging operations by placing large wood in stream channels. The 1990 Forest Plan stipulates that the “*primary objective for riparian areas will be to maintain and enhance long-term productivity to provide for riparian dependent resources.*” If an operator needs to clear woody debris, live vegetation, or rocks to facilitate any mining activities the District Ranger can require authorization under a Plan of Operation prior to the initiation of work.

Commercial harvest and prescribed burning treatments would create hazardous situations for miners. However these will be temporary in nature and typically would leave the forest floor more open than before treatments, making it easier for miners to hike cross county.

Prescribed burning could be implemented from spring through the summer and into the fall months as long as burning conditions are met. Conditions for prescribed burning during the summer months are infrequent. Spring burning would occur when miners and prospectors are gearing up their operations for the year. In the fall mining operations are winding down and operations put in shut-down mode for the winter months. Consequently burning during spring and fall would occur when mining and prospecting would be at lower frequency than in summer and less likely to cause impacts.

Fire crews would work to keep fire from directly impacting mine features such as claim markers, equipment, supplies and structures.

Smoke may impact some miners as it would any other forest users. No impacts to operators were recorded during the prescribed burning in the fall of 2014.

Cumulative Effects for Alternative 2

There are no other foreseeable actions whose effects, in combination with Alternative 2, would result in a cumulative effect to active mining areas in the Project Area.

Consistency Finding

The Project may affect access to some mining areas, but operators may request authorization for vehicular access for mining activities through a separate Plan of Operation. Mining rights would not be taken away by the Swauk Pine Project.

Cultural Resources

Introduction

A detailed account of the historic human uses of the Project Area is available in the Cultural Resources Specialist Report (SR). Cultural resource properties are present in the Project Area, and proposed actions are reviewed for their potential effects to those properties.

Regulatory Framework

Forest Plan Standards and Guidelines

The Okanogan and Wenatchee National Forest (OWNF) Land and Resource Management Plans (1989, 1990) tier to the laws and regulations cited below and to corresponding Forest Service Handbook and Forest Service Manual direction. Forest-wide management standards that are pertinent for this cultural resource effects analysis include:

- Conduct a professionally supervised cultural resource survey on National Forest lands to identify cultural resource properties. Use sound survey strategies and the OWNF Cultural Resource Inventory Survey Design and site location predicative model.
- Evaluate the significance of sites by applying the criteria for eligibility to the National Register of Historic Places (National Register Bulletin 15).
- Consider the effects of all Forest Service undertakings on cultural resources. Coordinate the formulation and evaluation of alternatives with State and Federal agencies, and with leaders and the Tribal Historic Preservation Officer (THPO) of American Indian tribes with historic ties to the project planning area.

The Forest works closely with American Indian tribes; specifically the Confederated Tribes and Bands of the Yakama Nation and the Confederated Tribes of the Colville Reservation who retain rights on national forest land by virtue of:

- Executive Order of 1872; North-Half Agreement of 1891 (Confederated Tribes of the Colville Reservation)
- Yakima Treaty of 1855 (Yakama Nation)

Laws, Regulations, and Policies

The *National Historic Preservation Act* (NHPA) (16 U.S.C. 470) of 1966, as amended, requires federal agencies to consider effects to cultural resources during project planning and implementation. Implementing regulations that clarify and expand upon the NHPA include 36 CFR 800 (Protection of Historic Properties), 36 CFR 63 (Determination of Eligibility to the National Register of Historic Places), and 36 CFR 296 (Protection of Archaeological Resources). To be in compliance with the NHPA, the Pacific Northwest Region of the Forest Service, the Advisory Council on Historic Preservation (ACHP), and the Washington State Historic Preservation Officer (SHPO), signed a programmatic agreement (PA) regarding the management of cultural resources on national forests in Washington State in 1997. The 1997 PA outlines specific procedures for the identification, evaluation, and protection of cultural resources.

The *National Environmental Policy Act* (NEPA) of 1970 requires agencies to analyze the effects of their actions on sociocultural elements of the environment which includes cultural resources.

The *National Forest Management Act* (NFMA) of 1976, the *Archaeological Resources Protection Act* (ARPA) of 1979, the *Native American Graves Protection and Repatriation Act* (NAGPRA) of 1990, Executive Order 13007 (Indian Sacred Sites), and *Executive Order 11593: Protection and Enhancement of the Cultural Environment*, also guide Forest Service decision-making as it relates to cultural resource management.

Executive Order 13175: Consultation and Coordination with Indian Tribal Governments directs federal agencies to engage in meaningful consultation and collaboration with Indian tribes in the development of Federal policies that have tribal implications. The order is designed to strengthen the government-to-government relationship and to reduce the imposition of unfunded mandates upon tribes.

Consultation with Tribes and the State Historic Preservation Officer

The laws, regulations and directives cited above direct the Forest Service to consult with American Indian tribes, the SHPO, and other interested parties regarding the management of cultural resources on lands managed by the Okanogan-Wenatchee National Forest. Consultation with tribes on the Swauk Pine project was conducted in accordance with NHPA, NEPA, and Executive Order 13175 “Consultation and Coordination with Indian Tribal Governments”. Government-to-Government consultation letters were sent to the Confederated Tribes of the Colville Reservation and to the Yakama Nation on March 27, 2014. No response was received but in February of 2015 the Forest received a letter from the Yakama Nation requesting review of all ground disturbing cultural resource reports. The Tribal Historic Preservation Officer (THPO) for the Confederated Tribes of the Colville Reservation did not requested review of the cultural resource report prepared for this project but the draft Section 106 report will be mailed to them for review and comment as well. Documentation of compliance with the NHPA was prepared in accordance with the Forest’s 1997 programmatic agreement regarding the management of cultural resources on national forests in Washington State. Consultation with the Washington SHPO is on-going but will be completed prior to signing the Swauk Pine project decision.

Methods and Scale of Analysis

The project area of potential effect (APE) is the Swauk Pine project planning area and two road segments just outside the planning area that will be used as haul routes. The cultural resources effect analysis, including cumulative effects, focuses on cultural resources identified within the project planning area boundary. The proposed action will have no known indirect effects (i.e., visual, auditory, atmospheric) on cultural resources that are located outside of the APE.

Existing Conditions

A detailed description of historical human uses of the Project Area is available in the Cultural Resources Specialist Report.

Cultural resource identification efforts in the Swauk Pine project planning area have focused on three primary types of resources: prehistoric archaeological sites, historic archaeological sites, and traditional cultural properties (TCPs), which are valued places to contemporary Indian and non-Indian communities. Cultural resource identification efforts have included pedestrian field surveys, literature reviews, Geographic Information Systems (GIS) analysis, and consultation with American Indian tribes that are historically associated with the area.

Information for the effects analysis was gathered from Okanogan-Wenatchee Heritage Program GIS data, cultural resource reports and records; archaeological, historic, and ethnographic overviews; the Washington State Department of Archaeology and Historic Preservation; by field inventory conducted by cultural resource specialists (CRS) and para-professionals working under the supervision of a CRS, and from consultation with Tribal Historic Preservation Officers (THPO) for the Confederated Tribes of the Colville Reservation and the Confederated Tribes and Bands of the Yakama Nation respectively.

The OWNF defines a cultural resource site as a locus of purposeful and interpretable human activity containing physical manifestations of that activity (e.g. one or more features with or without artifacts; one or more formal tools found in association with other cultural materials; diverse cultural materials in densities beyond the level of one or a few lost artifacts (isolated find); or physical manifestations of human activity that in the professional opinion of an archaeologist are indicative of purposeful human activity). These resources are typically at least 50 years old.

Eighteen (18) cultural resource surveys (all Forest Service) have taken place within the Swauk Pine planning area since 1978. These surveys were in support of timber sales, road construction and/or improvement, prescribed burning, and issuance of special use permits for mine-related activities. These surveys resulted in the documentation of 50 cultural resource sites within the Swauk Pine project planning area. Site types include cabins, homesteads, mines (hard rock and placer), railroads, refuse scatters, roads, and ditches. No prehistoric/precontact cultural resources have been documented in the project planning area.

In order to meet the requirements set forth in Section 106 of the NHPA, as amended, and the Forest's 1997 PA with SHPO, a sample cultural resource inventory of the project planning area began in 2012 and was completed in 2015. The Forest's cultural resource site location probability model was used to identify areas for survey. This model uses a variety of environmental variables such as slope, distance to water, and landform type along with oral and recorded history to predict the likelihood that an area will contain material evidence of past human activity. Sample strategy standards require that intensive, systematic pedestrian survey be applied to no less than 100% of high site probability areas, 35% of moderate probability areas, and 5% of low probability terrain. Transect spacing must be no more than 30 meters.

Acres previously covered under cultural resource inventories that met current standards were not resurveyed. This included 626 acres of low site probability, 17 acres of medium site probability and 732 acres of high site probability terrain. Per the survey model, a total of 468 acres required inventory. But because the planning area overlaps two historic mining districts, a total of 1443 acres were inventoried.

Table 3.34. Site Probability Model and Acres Surveyed

Site Probability	Planning Total Area Acres	APE Acres Previous Surveyed	APE Acres Un-surveyed	Percent Coverage Required	Survey Acres	*Total Acres Surveyed	Actual Coverage
High	777	732	45	100%	45	45	100%
Moderate	211	17	194	35%	194	194	100%
Low	5207	626	4581	5%	229	1204	26%
TOTAL	6195	1375	4829		468	1443	

**A lot of the low site probability area overlaps the Swauk/Liberty Mining Districts so additional inventory of low site probability terrain was warranted.*

This survey led to the documentation of 19 new cultural resource sites. Together with 50 previously documented sites, a total of 69 cultural resource sites exist in the planning area. Site types include mines, cabins, railroad grades, ditches and refuse scatters. No prehistoric/pre-contact sites were found.

National Register of Historic Places Evaluation

One goal of cultural resource management in the Forest Service is the protection of cultural resources that are listed, eligible, or potentially eligible for the National Register of Historic Places (NRHP). Title 36 CFR 60.4 identifies the criteria for determining significance (36 CFR 60.4). Significance of a cultural resource is based on the integrity of location, design, setting, materials, workmanship, feeling, and association, and,

- (A) the association with events that have made a significant contribution to the broad patterns of our history; or
- (B) the association with the lives of persons significant in our past; or
- (C) the embodiment of the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- (D) the ability to yield or potentially yield additional information important in prehistory or history.

A cultural resource that meets one or more of the four criteria is considered eligible for listing on the National Register. If a cultural resource site does not meet the criteria, it is not eligible for the Register. Sites that cannot be determined eligible or ineligible without testing or further research are considered unevaluated and are granted the same protection afforded to eligible sites pending further study.

Of the 69 sites located in the Swauk Pine planning area, one is listed on the National Register, 11 are eligible, two (2) are unevaluated, and 56 are ineligible or recommended ineligible pending SHPO concurrence.

Environmental Consequences

If cultural resource site integrity is altered or threatened by project activities, that project is considered to have a direct and/or indirect effect on the site. The Swauk Pine Restoration Project may potentially have direct, indirect and cumulative effects on cultural resource sites identified within the planning area.

The criteria for determining a project's effect on cultural resources is found in 36 CFR 800.5. Three types of effect are recognized:

- No Effect - when no National Register listed or eligible sites are present or when National Register listed or eligible sites are present but project activities will not affect them.
- No Adverse Effect - when National Register listed or eligible sites may be affected by project activities but mitigation measures are in place to avoid adversely affecting them.
- Adverse effect - when a project will “alter directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property’s location, design, setting, materials, workmanship, feeling, or association.”

Site avoidance during project implementation is the preferred method of management for cultural resources that are listed, eligible, or unevaluated/potentially eligible for the NRHP.

Alternative 1 - No Action

Direct and Indirect Effects

Under the No Action alternative there would be no direct or indirect effects on 69 cultural resources located in the Swauk Pine project planning area. Site condition would continue to degrade naturally.

Alternative 2 - Revised Proposed Action

Direct and Indirect Effects

Of the 69 cultural resource sites in the Swauk Pine planning area, skyline logging, road construction or decommissioning, log landings, and burning are proposed within the boundary of 17 sites. The Forest Archaeologist has determined that 12 of those sites are not eligible for the National Register of Historic Places. Pending concurrence on eligibility by the SHPO these sites will be avoided. If SHPO agrees that the sites are not eligible, no further management/protection of the site(s) will be required during project implementation.

Treatments are proposed within the boundaries of five (5) sites that are National Register eligible or potentially eligible/unevaluated. Burning is proposed within three (3) of those sites. One site is a ditch and the other two sites are cabins and mines. Low intensity burning of vegetation within/adjacent to the ditch will not adversely affect it. At the other two sites vegetation will be cut, manually carried off site, and burned in order to not adversely affect the sites. Decommissioning of a modern, user-built road is proposed at a mine site but site features adjacent to the road will and can easily avoided. At another historic mine, logging operations will be modified to avoid site features. With these mitigation measures in place, implementation of the Swauk Pine project will have no adverse effect on cultural resources.

Cumulative Effects

Past and future forest management projects had/have the potential to cumulatively impact National Register listed or eligible cultural resources within the project area. Ongoing and future monitoring and inspections of known or newly identified cultural resources in the project area would trigger adjustments in management practices to ensure that effects to National Register eligible cultural resources are considered in project planning and mitigated as necessary prior to project implementation.

Consistency Finding

Federal laws direct and guide the Forest Service in identifying, evaluating and protecting cultural resources. The Okanogan-Wenatchee National Forest Plan tiers to these laws, therefore the proposed alternative meets Forest Plan Standards and Guidelines for cultural resource management. The Forest has complied with Section

106 of the NHPA by considering effects to cultural resources in the planning area. In compliance with the Forest Plan and in completion of the Section 106 of the NHPA, all relevant laws and regulations have been met.

Scenery

Regulatory Framework

- The Okanogan-Wenatchee National Land and Resource Management Plan 1990 (WNFP) specifies scenic quality objectives and recreation setting objectives for the Swauk Pine Project area.

Methods and Scale of Analysis

The scenery effects analyses used for this report are those found in the Scenery Management Handbook #701. Scenery management is based on the classic aesthetic factors of form, line, color and texture, as well as the principles of sense of place. “Scenic integrity measures the amount of natural or socially valued appearance in a landscape along with the amount of visual disturbance that contrasts with and detracts from the appearance (the valued scenic character) existing at the time of measurement.”

The analysis area in the Swauk Pine Integrated Fuels Reduction Project is analyzed in the context of the surrounding landscape. The following are criteria for measuring changes to the existing landscape character:

- Amount of changes seen on the landscape, shape, size and arrangement of vegetation management units and harvest methods, location and amount of new, re-opened or re-constructed roads in visually sensitive areas, and location of units in a given viewshed from fixed viewpoints.
- Consistency with Forest Plan standards and guidelines; the resulting scenic integrity level in the short and long term based on how well vegetative treatments and restoration activities meet the established VQO as viewed from Liberty Road Viewshed and community of Liberty, Lion Gulch FR 9712 loop to Cougar Gulch FR 9718 & Durst Creek FR 9705 and the backdrop setting along private lands from Williams Gulch to Price Ranch.

Existing Conditions

Landscape Character

Local residents and recreation users value the scenery within the Swauk Pine Project Area. The landscape character is predominately a naturally appearing to slightly altered and moderately altered forested environment viewed in the foreground, middleground and background of the viewsheds.

The landscape character goal for the Swauk Pine Project area is to maintain a naturally appearing to slightly altered landscape character that expresses predominately natural processes in the scenic viewsheds. A transitional approach to move the high density stands towards a lower density species pattern and composition, becoming more fire resilient and ecologically sustainable in time is desirable for the landscape character. Enhancement of large tree viewing opportunities from travel routes, trails, viewpoints, and private residences and maintaining variety with tree species such as fall color aspects of Aspen and Western Larch is desirable. There is opportunity to increase landscape variety by creating and maintaining a series of specific plant stages that leave a diversity of different age classes and a variety of natural appearing open spaces are desirable for both landscape character and scenic enhancement. From a scenery enhancement approach, ecologically sound landscapes can also be aesthetically pleasing as well as sustainable, being reflective of the inherent natural

disturbance regimes that are in scale to the appropriate vegetative type, whether it is fire, insects or disease. When the amount exceeds the ecosystem parameters, the risk of unnatural catastrophic level disturbances increases and can cause a dramatic change to the existing scenery and landscape character.

Reductions and improvements in the forest road system to improve watershed and ecological conditions are beneficial management actions that improve scenic quality in the landscape. Restoration of areas to improve floodplains, hydrologic functions, and treating invasive plants all benefit scenic quality.

Scenic Integrity

Every landscape changes over time, in turn, the landscape vegetative character continues to change whether it is actively managed or allowed to naturally evolve. In the Swauk Pine Project area, there has been a change in historic vegetative species and vegetative patterns as described in the forest vegetative conditions narrative. Human caused disturbances occur at large, mid and small scale patterns across the landscape. The major changes are mainly attributed to past timber sales, building roads, creation of mining operations, and development Liberty and other rural residences over the last century. In a majority of the area, the resulting patterns lack a diverse and more complex forest structure. Old growth characteristics and late successional forest are not dominant.

Scenic integrity is measured as the amount of human caused deviation in form, line, color, and texture of a landscape. Scenic integrity serves as a frame of reference for measuring scenic integrity levels based on the valued attributes of the existing landscape character being viewed. The degrees of integrity vary from VERY HIGH to VERY LOW. Scenic Integrity is measured on the Okanogan-Wenatchee National Forest through Visual Quality Objective levels defined by the USFS Visual Management System's Chapter 1 USDA Handbook # 462.

The Swauk Pine Project area has a range of scenic integrity levels (conditions) from Low to Moderate to High, slightly to moderately altered to naturally appearing based on vegetative characteristics. The scenic integrity levels meet the Forest Plan Standards and Guidelines for a natural appearing foreground or slightly altered viewed from the designated travel routes. Some areas also meet a higher scenic integrity level of Partial Retention to Retention in areas allocated to General Forest, Modification VQO.

Visual Quality Objectives

The project area is seen as immediate foreground (views up to 300 feet distance), foreground (views up to ½ mile distance) and middleground (views up to 4 miles distance) from several viewsheds and viewpoints. The project area is divided into three main landscape areas for scenic analysis based on landscape visibility, sensitivity levels and visual quality objectives for the scenic travel routes. The potentially affected viewsheds are:

1. The Liberty Road Viewshed and Community of Liberty (Retention VQO foreground)
2. Lion Gulch FR 9712 loop to Cougar Gulch FR 9718 & Durst Creek FR 9705 (Partial Retention VQO foreground and Modification to Maximum Modification middleground).
3. Backdrop setting along private lands from Williams Gulch FR 9718-115 to Price Ranch (Partial Retention VQO foreground, Modification to Maximum Modification middleground).

The rest of the project area is allocated as General Forest (GF) Modification VQO. It is possible to meet a higher VQO (either Partial Retention or Retention) in areas that are sensitive for recreation and scenic

objectives, these areas include views from private residences. There are no developed recreational facilities.

In areas designated to Retention VQO, all foreground landscapes shall have the visitor perception of natural appearing and will have HIGH scenic integrity. *HIGH scenic integrity refers to landscapes where the valued landscape character “appears” intact. Deviations may be present but must repeat the form, line, color, texture, and pattern common to the landscape character so completely and at such scale that they are not evident. (Landscape Aesthetics Handbook 701, p 2-4).*

In Partial Retention VQO areas the visitor will perceive a natural appearing to slightly altered landscape viewed in foreground and middleground areas and will have MODERATE scenic integrity. *MODERATE scenic integrity refers to landscapes where the valued landscape character “appears slightly altered”. Noticeable deviations must remain visually subordinate to the landscape character being viewed. (USDA FS, 1995, Landscape Aesthetics, p2-4).*

In areas designated to Modification VQO, human activities would be visually evident, but should blend into the landscape by utilizing naturally established form, line, color and texture of the natural landscape. Modification areas would have LOW scenic integrity. *LOW scenic integrity refers to landscapes where the valued landscape character “appears moderately altered”. Deviations begin to dominate the valued landscape character being viewed but they borrow valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes or architectural styles outside the landscape being viewed. They should not only appear as valued character outside the landscape being viewed but compatible or complimentary to the character within. (USDA FS, 1995, Landscape Aesthetics, p2-4).*

Desired Landscape Character

People’s interests and expectations regarding ecosystems help establish desired aesthetic conditions for the varied landscapes. The desired landscape character is to promote a sustainable landscape character specific to each ecotype of the forest. All naturally established existing landscape patterns throughout the forest are to be maintained with changes that will not degrade the existing character. Areas where unnatural landscape character exists from past management practices can be improved through rehabilitation or enhancement to promote landscape character that is scenically and ecologically attractive. The goal of scenery management is to promote landscape character that is naturally appearing and will be scenically sustainable in time. The aesthetic characteristics of landscapes are an integral part of community life, forming the “sense of place” in which people live and interact with one another. Individuals who visit the Forest to experience its “natural appearing” and/or “cultural” landscape qualities value high scenic quality.

The landscape character goal for the Swauk Pine Project area is to maintain a natural appearing to slightly



altered landscape character that expresses predominately natural processes in the scenic viewsheds where those landscape patterns exist. A transitional approach to move the high density stands towards a lower density species pattern and variety in composition through thinning management activities is desirable for the landscape character and scenic enhancement. Restoring old growth characteristics with a more complex forest structure is beneficial for scenic quality. Enhancement of large tree viewing opportunities from

travel routes, trails, viewpoints, and maintaining variety with tree species such as fall color aspects of riparian areas is desirable.

Restoration activities of closing roads or converting roads to trails would benefit the scenic resource by reducing linear contrast in the viewsheds in the long term. Restoration of unique habitats, floodplains and treating invasive plants would increase landscape scenic variety.

Overall Desired Scenic Integrity and Landscape Character of the Project Area

1. Enhance landscape character by increasing vegetation variety by promoting different age classes of tree species, exposing large Ponderosa pine, Larch, and Douglas-fir tree boles for viewing along the travel routes.
2. Maintain and promote a variety of tree densities that range from a natural appearing higher density stand to a variation of high, moderate, and low spacing. Promote a wide variety of tree spacing for landscape variety.
3. Promote and design park like stands within view of Liberty Road Viewshed and Community of Liberty, Lion Gulch FR 9712 loop to Cougar Gulch FR 9718 & Durst Creek FR 9705, and backdrop setting along private lands from Williams Gulch to Price Ranch and other private properties in the rural interface where large trees exist.
4. Promote landscape character that is naturally appearing and will be scenically sustainable in time by reducing some risk of large scale disturbances, through wildfire or insect and disease infestations.
5. Visually link riparian and wildlife corridors, patches, and edges by using irregular spaced clumping and feathering. Use variable uneven spacing with leave clumps of overstory and understory.
6. The foreground view from the community of Liberty should be managed to be natural appearing and maintain high landscape character and scenic integrity.
7. The foreground viewed from Lion Gulch FR 9712 loop to Cougar Gulch FR 9718 & Durst Creek FR 9705, and backdrop setting along private lands from Williams Gulch to Price Ranch and rural private property areas should be managed to be near natural appearing and maintain moderate landscape character and scenic integrity.
8. Methods used to control prescribed burns should not dominate naturally established form, line, color and texture of the area.

Environmental Consequences

Direct and Indirect Effects

Alternative 1

A no action alternative would have no short term effects to scenic integrity and landscape character. Existing scenery integrity and landscape character would remain the same.

The indirect long term effects related to the existing conditions and trends could be substantial. The overstocked stands are under greater and greater stress which is likely to lead to insect and disease epidemics. Fuel loads within the stands increase the hazards of stand replacement fire. All of these conditions would continue to degrade the scenic stability. In the event of a stand replacement fire the scenic integrity would likely be greatly reduced by uncharacteristic fire because the firefighting opportunities would be limited due to fuel conditions that effect flame lengths.

The landscape would remain as a mosaic pattern of natural appearing to slightly altered and altered landscape character and scenic condition as it currently exists. The vegetative component of the landscape would continue

to grow through the pattern of natural succession with a high risk of future wildfire. The established vegetative patterns resulting from forest succession would be retained; in view that fire suppression resulting from human influences is an inadvertent effect and a natural event which shapes forest landscapes. The highly textured tree density patterns would continue to dominate the landscape character.

Scenic quality of landscape character and condition would have very low human intervention with nature taking its course. Color and texture would be mosaics dominating the landscape patterns through vegetation patterns changing throughout the seasons. Aspen groves, Western Larch and riparian vegetation add brilliant yellow and red fall color. The role of natural fire had an effect on the composition of the vegetation patterns and added to the variety of form and color. The forms that would have been most common in the historic landscape would be proportionally in scale to the naturally established landscape and would likely be seen as irregular openings resulting from fires. The vegetation patterns are predominately dry site species with a mix of age classes, Grand-fir has encroached upon many of the desirable large tree species of Ponderosa Pine and Western Larch. Large tree characteristics are seen viewed from the community of Liberty, various homes located along the valley bottom and throughout all three viewsheds.

There would not be the opportunity to enhance scenic quality by creating more large trees. A sustainable green scenic forest may not be maintained over time because of the high risk of wildfire and the dramatic change in setting that would result. The visual effects of a large scale wildfire would change the landscape character to a black, brown, and green interwoven landscape pattern. Wildfire visual characteristics would be visually dominant and evident for 5 to 10 years or more; snags would be created as a result of wildfire. The snags would be dominant for at least 5 years, and then begin to fall and create a jackstraw effect viewed along the travel corridors and would appear visually negative. There would be some risk to losing the highly valued larger Ponderosa Pine, Douglas-fir and Western Larch trees if a wildfire were to occur.

Alternative 2

Vegetation removal, fuels reduction management activities and associated transportation changes would affect landscape character and scenic integrity (condition). There are two primary aspects that affect scenic quality, 1) vegetation treatment proposed and implementation of the vegetation treatment (logging systems) and 2) prescribed fire and underburning and implementation of surface fuel treatments.

Landscape character changes would occur similarly to the scenic integrity. Landscape character refers to the naturally established landscape patterns that make each landscape identifiable or unique. For this analysis, focus will be on the vegetative element of the landscape character and the visual effects that would result from proposed thinning and reducing tree density and effects of fuels underburning, pile burning and prescribed fire. Landform would be unchanged, the dissected landform in the Swauk Pine Project area has several stream lined valleys that rise to the surrounding ridgelines. This variety in landform provides the opportunity to spatially blend in treatment.

Scenic integrity is the amount of human caused deviation in form, line, color, and texture of a landscape. Scenic integrity serves as a frame of reference for measuring scenic integrity levels based on the valued attributes of the existing landscape character being viewed. In the Swauk Pine Project area, scenic integrity changes would be seen as the result of changes to landscape character caused by implementation of the management activities and amount of ground disturbance or vegetation removal in foreground areas (such as roads opened or closed, construction of new temporary roads, new skid trails and skyline corridors, new tree stumps and slash, blackened tree boles, or disturbance to the ground from mechanical activity of cutting trees). The degrees of integrity vary from very high to very low. The degree of scenic altered condition depends on the amount of

changes seen from identified viewsheds.

Overall, the reduction of fuels and thinning to enhance large tree growth in the landscape, dry series type, would benefit long term scenic quality by providing a more stable, sustainable forest which is typical of the Northeast Cascade vegetative character types.

Important design measures to reduce the unavoidable visual effects in sensitive areas include:

- using special markings to provide variable spacing of leave trees
- leaving vegetative texture along the identified travel routes and destination areas
- rehabilitating ground disturbed areas where they would be seen in foreground
- cutting stumps low to the ground in seen areas of foreground of identified travel routes and destination areas
- locating landings outside of seen areas from Liberty

The following is a summary of general effects:

Landscape Character and Scenic Integrity Positive Effects

1. Enhancement of landscape character would be done by thinning and reducing dense stands of young trees, providing variety in spatial distribution of plant communities and moving towards more variety in age classes. Large diameter trees would be retained and would stand out as more dominant after removing small trees around them, views into the forest would be more open.
2. Enhancing large Ponderosa pine and Western larch trees by removing small encroaching vegetation around them.
3. Moves the forest setting on a landscape scale towards the sustainable landscape character by burning small trees and slash created by the thinning activities proposed.
4. Aspen would be enhanced with the use of prescribed fire, maintaining Aspen and riparian vegetation is desirable for fall color and diversity in landscape character of vegetative species.
5. Utilizing existing landings, roads, fire lines and natural fuel breaks will reduce further visual impacts associated with implementation. Visual impacts are contained in areas already impacted rather than introducing new impacts.
6. Treatment methods of thinning and pruning are texture changes to the existing dense to mosaic textured landscape and will blend in well.
7. On the landscape scale, by using prescribed fire in a timely manner and in phased treatments, it is expected to reduce the future risk of high intensity wildfire that would affect scenic quality.

Landscape Character and Scenic Integrity Potential Negative Effects

1. Stumps would be seen in some areas of foreground of Forest roads and from some private residences. Slash would be seen spread around the drainages before under burning, hand or machine piling, and pile burning; proposed under burning and pile burning may not entirely reduce the slash.
2. Short-term visual effect of exposing linear corridors of roads by removal of vegetation and soil disturbance, the areas would be rehabilitated after implementation. Longer-term visual effect for vegetation to grow and provide screening of linear corridors.
3. Potential Long to Short-term visual effect of introducing linear corridors resulting from skyline logging system.
4. Prescribed fire has the potential to create larger forms (openings) in the landscape than intended, possibly burn out of the area intended, and/or to burn trees that are desired to be retained

Effects to Specific Viewsheds

Liberty

Landscape character changes would be seen as thinned out stands of trees and a more open forested canopy character. The larger diameter trees would be more visible from Liberty. The landings would be located out of view of Liberty viewshed, by containing disturbances to the road prism. Thinning around large trees will improve the landscape setting and enhance scenic quality. Prescribed burning would be done from upper elevations down to private land on the north side of Liberty. There would be some risk of skyline corridors creating a strong visible line in the highly textured forested setting. By using a feathering technique, and group selection cutting around the skyline corridors the corridors would blend in more easily. Line, color, and texture will be emphasized, there will be no forms (openings) introduced. The treatment activity would meet Retention VQO.

Treatments include 24 acres of commercial thinning and fuel treatments located at the upper ridgeline viewed from foreground of Liberty (unit 77). The area is highly visible and provides the backdrop setting for Liberty. The units would be harvested with skyline cable logging systems and 1 small unit of ground based at the Swauk Ridgeline. Skyline corridors and landings would be located in areas where they blend in to minimize visual impacts viewed from sensitive viewing areas. It is important to note skyline corridors and landings would be located after all trees have been felled. The variable density thinning from below would emphasize removing small diameter trees while retaining all old trees. The thinning would remove understory trees that would result in a mosaic texture change to the landscape character.

Natural Fuels Underburning is proposed from the ridgeline down to Liberty Road. This treatment would reintroduce fire to a fire dependent ecosystem, lessening the impact of a future high intensity wildfire and improving forage and browse quality for big game. Fire intensities would be kept low during implementation to minimize fire and fire effects in the overstory canopy. The effects to scenery are limited to foreground view effects of stumps, and slash. A growing season would reduce the effects to the remaining scorched tree trunks, and dead saplings. Fire, at low intensity is a natural occurrence in this area, and its effects do not degrade the scenic quality. This treatment can greatly improve a stands resiliency to large stand replacement fire which can affect the scenic quality. With the treatments scattered over a large landscape scale, direct effects to scenery would be minimal and short term. Removal of smaller trees opens view into stands.

Alternative 2 would meet the Retention Visual Quality Objective as prescribed for the Liberty Viewshed.

Lion Gulch FR 9712 loop to Cougar Gulch FR 9718 and Durst Creek FR 9705

Landscape character changes would be seen as thinned out stands of trees and a more open forested canopy character along the travel routes. The treatments are located in the foreground and middleground. By using the existing road for landings and containing disturbances to the road prism the scenic impacts to the forested setting will be minimized. Thinning around large trees will improve the landscape setting and enhance scenic quality, the trees would be more exposed for viewing from the travel routes. Prescribed burning would be done from upper elevations down to the forest roads which act as fuel break fire lines. There would be some risk of skyline corridors creating a strong visible line in the highly textured forested setting. By using a feathering technique, and group selection cutting around the skyline corridors the corridors would blend in more easily. Line, color, and texture will be emphasized, there will be no forms (openings) introduced. Pruning, hand pile and pile burning are techniques that would remain visually subordinate to the existing landscape character. Alternative 2 revised proposed action would meet the Partial Retention FG and Modification MG as prescribed

to the designated scenic viewsheds.

Commercial vegetation treatment areas would be harvested with skyline cable logging systems or ground based systems. Skyline corridors and landings would be located in areas where they blend in to minimize visual impacts viewed from sensitive viewing areas. It is important to note skyline corridors and landings would be located after all trees have been felled to utilize natural and created openings and minimize additional removal of trees. The variable density thinning from below would emphasize removing small diameter trees while retaining all old trees. There are areas of no treatment blocks that will break up the commercial fuels treatment. The thinning would remove understory trees that would result in a mosaic texture change to the landscape character.

Natural Fuels Underburning is proposed throughout the project area from ridgelines down to travel corridors. This treatment would reintroduce fire to a fire dependent ecosystem, lessening the impact of a future high intensity wildfire and improving forage and browse quality for big game. Fire intensities would be kept low during implementation to minimize fire and fire effects in the overstory canopy. The effects to scenery are limited to foreground view effects of stumps, and slash. A growing season would reduce the effects to the remaining scorched tree trunks, and dead saplings. Fire, at low intensity is a natural occurrence in this area, and its effects do not degrade the scenic quality. This treatment can greatly improve a stands resiliency to large stand replacement fire which can affect the scenic quality. With the treatments scattered over a large landscape scale, direct effects to scenery would be minimal and short term. Removal of smaller trees opens view into stands.

Protect Legacy Trees would be a positive action for landscape character and scenic integrity. Large tree viewing opportunities from the travel routes would be enhanced.

Riparian Large Wood The objective is to reconnect streams with their floodplains and halt downcutting by adding large woody debris (LWD, that is, whole trees, logs, or bundles of logs) to channels and floodplains. Wood placement would not be uniform—the sizes, amounts, orientation, and distances to the stream would vary according to site-specific restoration objectives. From a scenery perspective, restoring ecosystem function is positive for landscape character, changes would be seen along the Lion Gulch, Cougar Gulch, and Durst Creek travel routes in the foreground and could appear unnatural until the actions become weathered and vegetation is restored.

Site-Specific Aquatic Restoration work is proposed throughout the project area which would range from restoring degraded riparian soils, vegetation, and wetlands by confining dispersed recreation use and rehabilitating overused areas, restoring degraded channel conditions and aquatic habitat by adding large wood, restoring water storage capacity in floodplains and restoring fish passage. See Aquatic Restoration Sites Map for locations. From a scenery perspective restoring ecosystem function is positive for landscape character, changes would be seen along the travel corridors of Lion Gulch and Cougar Gulch in the foreground and could appear unnatural until the actions become weathered and vegetation is restored.

From a scenery perspective closing roads that are redundant, user made, or causing negative natural resource impacts is a positive move for increasing scenic integrity and restoring landscape character.

Alternative 2 revised proposed action would meet the Partial Retention FG and Modification MG as prescribed to Lion Gulch Viewshed.

Private lands from Williams Gulch to Price Ranch

Landscape character changes would be seen as thinned out stands of trees and a more open forested canopy character on the north side of the Williams Gulch travel route. The treatments are located in the foreground and middleground. By using the existing road for landings and containing disturbances to the road prism the scenic impacts to the forested setting will be minimized. Thinning around large trees will improve the landscape setting and enhance scenic quality, the trees would be more exposed for viewing from the Williams Gulch travel route. Prescribed burning would be done from upper elevations down to Cougar Gulch road and the Williams Gulch road which act as a fuel break fire line. There would be some risk of skyline corridors creating a strong visible line in the highly textured forested setting. By using a feathering technique, and group selection cutting around the skyline corridors the corridors would blend in more easily. Line, color, and texture will be emphasized, there will be no forms (openings) introduced. Pruning, hand pile and pile burning are techniques that would remain visually subordinate to the existing landscape character.

Alternative 2 revised proposed action would meet the Partial Retention FG and Modification FG/MG as prescribed to William Gulch Viewshed.

Commercial thinning units in the foreground and middleground of the travel route along Williams Gulch to Price Ranch would be harvested with skyline corridor systems. Skyline corridors and landings would be located in areas where they blend in to minimize visual impacts viewed from sensitive viewing areas. The variable density thinning from below would emphasize removing small diameter trees while retaining all old trees. The thinning would remove understory trees that would result in a mosaic texture change to the landscape character.

Natural Fuels Underburning is proposed in this area, this treatment can greatly improve a stands resiliency to large stand replacement fire which can affect the scenic quality. With the treatments scattered over a large landscape scale, direct effects to scenery would be minimal and short term. Removal of smaller trees opens view into stands.

Site-Specific Aquatic Restoration work is proposed in this area for restoration. See Aquatic Restoration Sites Map for locations. From a scenery perspective restoring ecosystem function is positive for landscape character, changes would be seen along Williams Creel and Cougar Gulch Creek in the foreground and could appear unnatural until the actions become weathered and vegetation is restored.

There are several unauthorized roads and trails located in this area that would be closed or decommissioned. From a scenery perspective closing roads that are redundant, user made, or causing negative natural resource impacts is a positive move for increasing scenic integrity and restoring landscape character.

Alternative 2 revised proposed action would meet the Partial Retention FG and Modification FG/MG as prescribed to Williams Gulch Viewshed.

Cumulative Effects

The effects of past and ongoing management actions are reflected in the description of existing conditions. There are no foreseeable future action that in combination with Alternative, would result in cumulative effect to scenery or viewsheds.

Consistency Finding

Alternative 2 would meet all visual quality objectives for scenic areas in the Swauk Pine project area.

Effects to Scenic Integrity and Landscape Character

Direct and Indirect Effects

Alternative 1

A no action alternative would have no short term effects to scenic integrity and landscape character. Existing scenery integrity and landscape character would remain the same.

The indirect long term effects related to the existing conditions and trends could be substantial. The overstocked stands are under greater and greater stress which is likely to lead to insect and disease epidemics. Fuel loads within the stands increase the hazards of stand replacement fire. All of these conditions will continue to degrade the scenic stability. In the event of a stand replacement fire the scenic integrity would likely be greatly reduced by uncharacteristic fire because the firefighting opportunities would be limited due to fuel conditions that effect flame lengths.

The landscape would remain as a mosaic pattern of natural appearing to slightly altered and altered landscape character and scenic condition as it currently exists. The vegetative component of the landscape would continue to grow through the pattern of natural succession with a high risk of future wildfire. The established vegetative patterns resulting from forest succession would be retained; in view that fire suppression resulting from human influences is an inadvertent effect and a natural event which shapes forest landscapes. The highly textured tree density patterns would continue to dominate the landscape character.

Scenic quality of landscape character and condition would have very low human intervention with nature taking its course. There would be no disturbance to the existing landscape, activities of creating new landings, slash piles, and mechanical disturbances to the landscape would not be introduced. In terms of assessing scenic quality, the vegetation patterns are the elements that change the most. Color and texture would be mosaics dominating the landscape patterns through vegetation patterns changing throughout the seasons. Aspen groves, Western Larch and riparian vegetation add brilliant yellow and red fall color. The role of natural fire had an effect on the composition of the vegetation patterns and added to the variety of form and color. The forms that would have been most common in the historic landscape would be proportionally in scale to the naturally established landscape and would likely be seen as irregular openings resulting from fires. The vegetation patterns are predominately dry site species with a mix of age classes, Grand-fir has encroached upon many of the desirable large tree species of Ponderosa Pine and Western Larch. Large tree characteristics are seen viewed from the community of Liberty, various homes located along the valley bottom and throughout all three viewsheds.

There would not be the opportunity to enhance scenic quality and improve the forested setting. The opportunity for enhancement of large tree character would not be done. There would not be an opportunity to begin moving the landscape character towards a more sustainable forest setting that is more resilient to fire and bug infestations, and consequently, reduce the risk of large-scale disturbance patterns, which are out of their natural regime. A sustainable green scenic forest may not be maintained over time because of this high disturbance risk related to high fuel loadings.

The No Action alternative would maintain the existing scenic integrity level with high fuel loadings with high potential to result in a sudden change to the landscape character that would be seen as a burned off area. The landscape character would dramatically change from a forested green setting to an area dominated by the visual evidence of wildfire, fire intensity patterns would probably range from low to moderate to high viewed in the foreground and middleground from the travel routes, community of Liberty, and private residences located

throughout the area. The visual effects of a large scale wildfire would change the landscape character to a black, brown, and green interwoven landscape pattern. Wildfire visual characteristics would be visually dominant and evident for 5 to 10 years or more; snags would be created as a result of wildfire. The snags would be dominant for at least 5 years, and then begin to fall and create a jackstraw effect viewed along the travel corridors and would appear visually negative. There would be some risk to losing the highly valued larger Ponderosa Pine, Douglas-fir and Western Larch trees if a wildfire were to occur.



Community of Liberty: View showing Liberty surrounded by densely forested hillsides. The mountains in the background are accessed from several travel routes in the Liberty Project area. This is a prime example of the Wildland-Urban interface where humans and their development meet or intermix with wildland fuel. Structures are scattered throughout the wildland area.

In summary, the no action alternative would not address the vegetation conditions that are the beyond the historic range of variability. Alternative 1 would not reduce the risk uncharacteristic wildfire that could cause undue effects to scenery, nor will it move the stands toward the desired condition.

Alternative 2

Vegetation removal, fuels reduction management activities and associated transportation changes will have an effect on the landscape character and scenic integrity (condition). There are two primary aspects that affect scenic quality, 1) vegetation treatment proposed and implementation of the vegetation treatment (logging systems) and 2) prescribed fire and underburning and implementation of surface fuel treatments.

Landscape character changes will occur similarly to the scenic integrity. Landscape character refers to the naturally established landscape patterns that make each landscape identifiable or unique. For this analysis, focus will be on the vegetative element of the landscape character and the visual effects that would result from proposed thinning and reducing tree density and effects of fuels underburning, pile burning and prescribed fire. Landform would be unchanged, the dissected landform in the Swauk Pine Project area has several stream lined valleys that rise to the surrounding ridgelines. This variety in landform provides the opportunity to spatially blend in treatment.

Scenic integrity is the amount of human caused deviation in form, line, color, and texture of a landscape. Scenic integrity serves as a frame of reference for measuring scenic integrity levels based on the valued attributes of the existing landscape character being viewed. In the Swauk Pine Project area, scenic integrity changes would be seen as the result of changes to landscape character caused by implementation of the management activities and amount of ground disturbance or vegetation removal in foreground areas (such as roads opened or closed, construction of new temporary roads, new skid trails and skyline corridors, new tree stumps and slash, blackened tree boles, or disturbance to the ground from mechanical activity of cutting trees). The degrees of integrity vary from very high to very low. The degree of scenic altered condition depends on the amount of

changes seen from identified viewsheds.

Overall, the reduction of fuels and thinning to enhance large tree growth in the landscape, dry series type, would benefit long term scenic quality by providing a more stable, sustainable forest which is typical of the Northeast Cascade vegetative character types.

Important design measures to reduce the unavoidable visual effects in sensitive areas include:

- using special markings to provide variable spacing of leave trees
- leaving vegetative texture along the identified travel routes and destination areas
- rehabilitating ground disturbed areas where they would be seen in foreground
- cutting stumps low to the ground in seen areas of foreground of identified travel routes and destination areas
- locating landings outside of seen areas from Liberty

The following is a summary of general effects common to the project area:

Landscape Character and Scenic Integrity Positive Effects

8. Enhancement of landscape character would be done by thinning and reducing dense stands of young trees, providing variety in spatial distribution of plant communities and moving towards more variety in age classes. Large diameter trees would be retained and would stand out as more dominant after removing small trees around them, views into the forest would be more open.
9. Enhancing large Ponderosa pine and Western larch trees by removing small encroaching vegetation around them.
10. Moves the forest setting on a landscape scale towards the sustainable landscape character by burning small trees and slash created by the thinning activities proposed.
11. Aspen would be enhanced with the use of prescribed fire, maintaining Aspen and riparian vegetation is desirable for fall color and diversity in landscape character of vegetative species.
12. Utilizing existing landings, roads, fire lines and natural fuel breaks will reduce further visual impacts associated with implementation. Visual impacts are contained in areas already impacted rather than introducing new impacts.
13. Treatment methods of thinning and pruning are texture changes to the existing dense to mosaic textured landscape and will blend in well.
14. On the landscape scale, by using prescribed fire in a timely manner and in phased treatments, it is expected to reduce the future risk of high intensity wildfire that would affect scenic quality.

Landscape Character and Scenic Integrity Potential Negative

5. Stumps would be seen in some areas of foreground of Forest roads and from some private residences. Slash would be seen spread around the drainages before under burning, hand or machine piling, and pile burning; proposed under burning and pile burning may not entirely reduce the slash.
6. Short-term visual effect of exposing linear corridors of roads by removal of vegetation and soil disturbance, the areas would be rehabilitated after implementation. Longer-term visual effect for vegetation to grow and provide screening of linear corridors.
7. Potential Long to Short-term visual effect of introducing linear corridors resulting from skyline logging system.
8. Prescribed fire has the potential to create larger forms (openings) in the landscape than intended, possibly burn out of the area intended, and/or to burn trees that are desired to be retained

Landscape Scenic Analysis Effects

The immediate foreground (up to 300' distance zone), foreground (up to ½ mile distance zone) and middleground (up to 4 miles viewing distance) of Liberty and travel routes is sensitive for new visual impacts. Maintaining large trees and minimizing visual impacts is important.

The following are actions that would affect scenery resources in all viewsheds:

Commercial Thinning and Treatment of Activity Fuels (1327 acres)

1. **Logging systems are based on slopes where 35% and less would be ground based and slopes greater than 35% would be skyline.** From a scenery perspective important measures that minimize visual impacts include leaving unthinned pockets in small steep inclinations in ground based areas. In skyline treatment areas, skyline corridors and landings would be located after all trees in the unit have been felled to take advantage of natural and created openings for corridors and to minimize additional removal of trees. Skyline corridors would be angled away from travel routes and trails to avoid a linear strip appearance.
2. **Landings** would be located out of seen areas and/or screened with existing vegetation or be located on existing roads.
3. **Thinning objectives and prescriptions for upland areas.** The objective for all thinned stands is to maintain or improve the variability within stands with retention of individual trees, clumps of 2 to 6 trees, and larger unthinned complex clumps. Clumps of large trees are particularly important, wherever possible, skyline corridors would be located to avoid the need to remove clumps of old trees. From a scenery perspective, thinning would remove understory trees to address uncharacteristic species composition, under-represented stand structures and unsustainable tree densities. These treatments would decrease competition and increase growth rates in the residual stand. Thinning from below would also decrease the risk of uncharacteristic disturbance from insects, disease and wildfire by promoting resistant species and increasing crown spacing. Thinning would cut across a range of tree diameters to address species composition and density. Selecting healthy ponderosa pine and western larch for retention would result in openings at naturally random intervals. Thinning from below opens up the stands by removing the smallest diameter trees, this provides greater viewing distances into the stand which is preferable. The appearance of the stands would be improved by retaining the largest healthier trees, especially Ponderosa pine and Western larch. There would be a variation of spacing between the prescriptions that retain a variety of density patterns and species compositions. The reduction of tree stocking levels would improve the resilience of the stands by reducing stress and ladder fuels, which reduces the risk of high insect and disease epidemic occurrence, and stand replacement wildfire. These are benefits that contribute to the improvement of scenic stability when carried out at a landscape scale. This treatment would create stumps, slash and soil disturbance that would be visible from foreground views. These effects would be minor within the first one to two years. As regrowth of shrubs and grasses occur these effects would be significantly reduced. Variable density thinning does not create openings that area visible from middleground or background distances. The effects of this prescription would not reduce the scenic integrity of the units.
4. **Treatment of activity fuels in upland areas,** Activity fuel” refers to the slash generated by logging, which can greatly increase fire risk. To reduce this risk and create a more fire-adapted forest, activity fuels in all commercial thinning areas (except the Hill Climb Restoration Area), would be treated by

underburning. Some areas may require pre-treatment to protect residual trees during the underburn. Pretreatments may include removal as firewood, and/or hand-piling and then burning piles. From a scenery perspective, removal of fuels in foreground areas is desirable to maintain a more natural appearing landscape character while reducing the introduced fire risk with slash generated by logging. In thinned stands where underburn occurs, the desired pattern is a mosaic landscape character with higher tree retention on lower slopes and less tree retention of upper slopes and ridgelines.

5. **Commercial thinning and underburning in riparian reserves.** Most commercial thinning stands encompass some Riparian Reserve. Within Reserves, aquatic objectives (such as retention of shade over water, and preserving roots that stabilize streambanks), take precedence over all other objectives. Thinning in outer reserves is needed to create growing space and increase the recruitment of large trees in and adjacent to floodplains. Edges between upland and riparian commercial thinning areas would be feathered to avoid creating edge. From a scenery perspective, the design measures for treating riparian reserves are compatible with scenery objectives by maintain a natural appearing landscape character by feathering unit edges and maintaining scenic integrity of riparian reserves.
6. **Experimental treatments** would be compatible with visual quality objectives.

Non-Commercial Vegetation Treatments

1. **Thinning with fire: Natural fuels underburning (2758 acres).** Thinning will be accomplished with natural fuels underburning in stands that are operationally difficult to reach, and on dry sites dominated by ponderosa pine and bitterbrush (45% of Project Area). Target areas include 436 acres in the Lion Rock Potential Wilderness Area (PWA), and 29 acres in Lion Rock Inventoried Road Area (IRA). Outside of PWA, areas targeted for natural fuels underburning may be pre-treated by limbing to remove lower branches, thinning out trees < 8", re-arranging fuels around legacy trees, pulling back fuels and/or lopping and scattering fuels. Within the PWA (and Inventoried Roadless Area [IRA], there would be no cutting of trees of any size except for incidental felling of trees in association with fireline construction. Natural openings and 4WD 334 would be utilized as burn unit boundary to minimize the need for felling trees and new fireline construction in PWA and IRA. From a scenery perspective this treatment would reintroduce fire to a fire dependent ecosystem, lessening the impact of a future high intensity wildfire and improving forage and browse quality for big game. Fire intensities would be kept low during implementation to minimize fire and fire effects in the overstory canopy. Fire would burn mainly through the surface fuels throughout the majority of the prescribed fire units. Individual or small group torching may occur in areas where there are sufficient ladder fuels, and in timber stands with high occurrences of mistletoe infected trees. Outside of the PWA and IRA prescribed fire areas are accessible by forest roads, but because of the terrain, natural fuel breaks, such as ridges or scabs, or hand lines would be used along prescribed fire perimeters. Landscape level prescribed fire implementation would include units that have other fuel treatments occurring prior to prescribed fire as well as prescribed fire units that have no other fuel treatments. Roads, trails, hand lines, streams or other natural fuels breaks would be used to control prescribed fire unit edges. The effects to scenery are limited to foreground view effects of stumps, and slash. A growing season would reduce the effects to the remaining scorched tree trunks, and dead saplings. Fire, at low intensity is a natural occurrence in this area, and its effects do not degrade the scenic quality. This treatment can greatly improve a stands resiliency to large stand replacement fire which can affect the scenic quality. Low intensity prescribed burning would occur after these treatments in areas that support fire tolerant ecosystems and

drier biophysical environments. With the treatments scattered over a large landscape scale, direct effects to scenery would be minimal and short term. Removal of smaller trees opens view into stands.

2. **Maintenance burning** (same effects as natural fuels underburning)
3. **Aspen regeneration (18 acres)** Treatment would entail thinning conifers up to 10" dbh within two tree heights from declining aspen (to create a fuel bed), and/or concentrating slash around declining aspen to ensure a high intensity burn that would stimulate suckering from roots. If after treatment, fire fails to kill enough co-dominant conifers in the stand; residual conifers may be felled or girdled to maintain no more than 20% crown closure around regenerating aspen. All tree felling would be done using chainsaws. Felled trees may function as natural fencing to protect aspen sprouts. After burning, natural or man-made fences may be erected to exclude elk, deer, and sheep from the regenerating stand (see connected actions, below). Fenced exclosures would be maintained for at least 10 years. From a scenery perspective, enhancement of Aspen groves would increase landscape variety and maintain fall color.
4. **Small diameter thinning with a masticator (90 acres)** (same effects as thinning listed above)
5. **Non-Commercial thinning (21 acres)** This prescription is thinning of smaller diameter selected trees (Ponderosa pine) in a young stand to stimulate the growth of the remaining desirable trees (Douglas-fir and western larch). May be accomplished by manual or mechanical (slash buster) methods. From a scenery perspective, this treatment reduces stocking levels to promote growth of desirable species, reduce disease, the threat of future insect outbreaks and ladder fuels that increase fire intensity and the occurrence of crown fires. This would result in a texture change to the existing highly established textured patterns in the dense forest stands resulting in a more varied pattern.
6. **Legacy tree protection (509 acres)** Target areas are moist mixed conifer stands where conditions are at or near the desired future condition (dense old forest with multiple layers of trees) (8% of Project Area). These stands are or will soon be habitat for the northern spotted owl. They typically contain legacy trees that are >200 years old. Legacy tree protection may preserve some future seed and shade sources should these stands burn. Planned treatment is designed to better protect legacy trees from wildfire by re-arranging fuels. No more than two legacy trees per acre would be selected for treatment. All trees <7" dbh within 30ft of the largest legacy trees (and a smaller radius for smaller trees) would be felled and hand-piled or pulled back and lopped and scattered. In addition, downed woody logs within 15' of legacy trees would be bucked and pulled back from legacy trees to reduce fire residence time. Piles and material pulled away from legacy trees would be placed even with or upslope of legacy trees. Larger material would be placed perpendicular to the contour. All piles would be left as prey base habitat. All work would be done by hand. No measureable change in overstory canopy is expected because the only cut trees would be from suppressed tree strata and these trees are generally all overtopped by larger trees. From a scenery perspective, protecting legacy trees would be a positive action for landscape character and scenic integrity. Enhancement of large tree viewing opportunities from travel routes, trails, viewpoints, and private residences and maintaining variety with tree species such as fall color aspects of Western Larch is desirable.
7. **Large wood replenishment (226 acres)** This action would treat approximately 8 miles of stream in the Lion Gulch and Cougar Gulch subdrainages, and affect 226 acres of riparian forest (3% of Project Area). The objective is to reconnect streams with their floodplains and halt downcutting by adding large woody debris (LWD, that is, whole trees, logs, or bundles of logs) to channels and floodplains.

Wood placement would not be uniform—the sizes, amounts, orientation, and distances to the stream would vary according to site-specific restoration objectives. From a scenery perspective, restoring ecosystem function is positive for landscape character, changes would be seen along the travel corridors of Lion Gulch and Cougar Gulch in the foreground and could appear unnatural until the actions become weathered and vegetation is restored.

The landscape has been divided into three areas for scenic analysis based on where the proposed units are in relation to the travel routes, community of Liberty, and other private residences located throughout the rolling dissected valley landscape pattern.

1. Liberty Road Viewshed and community of Liberty
2. Lion Gulch FR 9712 loop to Cougar Gulch FR 9718 & Durst Creek FR 9705
3. Backdrop setting along private lands from Williams Gulch to Price Ranch

See the Specialist Report for actions specific to each analysis area for scenery.

Alternative 2 – Effects to the Liberty Road Viewshed and Community of Liberty

Alternative 2 is a set of stand and fuels treatments designed to address the purpose and need. This alternative is fully defined in Chapter 2. The treatments would serve to improve the overall scenic stability by addressing the conditions that put scenic attributes at risk of stand replacement fire and insect and disease epidemics. It is not expected that the risk would be eliminated. However, the treatments would improve opportunities for firefighters to minimize the fire effects. The treatments would improve the long term scenic integrity, by opening the stands up for increased visibility and visual diversity. Forest structure would be moved toward conditions historically present and the risk of high severity disturbance on the landscape, including within riparian area, would be reduced through a combination of commercial thinning, non-commercial thinning, and prescription burning. Commercial products would be produced by these activities. The logging activities would cause short term effects that would reduce scenic integrity for a period of 1-3 years. Ground based logging would create visible effects for the first year including ground disturbance, slash and debris, but after a growing cycle these effects would be negligible. Skyline cable yarding systems have the potential to create lines in the landscape from corridors. The corridors would be designed to limit visibility of the linear effects by softening linear edges with feathering or using irregular edges, leaving clumps to create blended edges along units or roads. See effects common to all action alternatives.

Alternative 2 would improve forest health, resiliency to disturbance, reduce the risk of wildfire within the wild urban interface, and provide economic benefit to the local economy. Alternative 2 would treat 4930 acres with a combination of commercial (1327 acres) and a variety of non-commercial treatment (2758 acres) or other enhancement activities (845 acres) of the project area to improve species composition, stand density, and reduce ladder fuels and canopy closure. These treatments would improve scenic stability from moderately high to low where “all dominant scenery attributes of the valued scenic character are present and are likely to be sustained” (pg19, App. J). The appearance of the stands would be improved by making them appear healthier. These treatments would create stumps, slash and soil disturbance would be visible from foreground views. These effects would be minor within the first one to two years. As regrowth of shrubs and grasses occur these effects would be significantly reduced. These treatments would not create openings that area visible from middleground or background distances. The effects of this prescription would not reduce the scenic integrity of the viewsheds as they are expected to be negligible within 2-3 years.

Landscape character changes would be seen as thinned out stands of trees and a more open forested canopy character. The larger diameter trees would be more exposed for viewing from Liberty. The landings would be

located out of view of Liberty viewshed, by containing disturbances to the road prism and out of view of Liberty scenic impacts would be minimized. Thinning around large trees will improve the landscape setting and enhance scenic quality. Prescribed burning would be done from upper elevations down to private land on the north side of Liberty. There would be some risk of skyline corridors creating a strong visible line in the highly textured forested setting. By using a feathering technique, and group selection cutting around the skyline corridors the corridors would blend in more easily. Line, color, and texture will be emphasized, there will be no forms (openings) introduced. The treatment activity would meet Retention VQO.

Alternative 2 Effects to Lion Gulch FR 9712 loop to Cougar Gulch FR 9718 and Durst Creek FR 9705

Landscape character changes would be seen as thinned out stands of trees and a more open forested canopy character on both sides of the Lion Gulch 9712 travel route. The treatments are located in the foreground and middleground. By using the existing road for landings and containing disturbances to the road prism the scenic impacts to the forested setting will be minimized. Thinning around large trees will improve the landscape setting and enhance scenic quality, the trees would be more exposed for viewing from the Lion Gulch travel route. Prescribed burning would be done from upper elevations down to the Lion Gulch road which acts as a fuel break fire line. There would be some risk of skyline corridors creating a strong visible line in the highly textured forested setting. By using a feathering technique, and group selection cutting around the skyline corridors the corridors would blend in more easily. Line, color, and texture will be emphasized, there will be no forms (openings) introduced. Pruning, hand pile and pile burning are techniques that would remain visually subordinate to the existing landscape character. Alternative 2 revised proposed action would meet the Partial Retention FG and Modification MG as prescribed to Lion Gulch Viewshed.

Alt 2 Effects to Backdrop Setting Along Private Lands from Williams Gulch to Price Ranch

Landscape character changes would be seen as thinned out stands of trees and a more open forested canopy character on the north side of the Williams Gulch travel route. The treatments are located in the foreground and middleground. By using the existing road for landings and containing disturbances to the road prism the scenic impacts to the forested setting will be minimized. Thinning around large trees will improve the landscape setting and enhance scenic quality, the trees would be more exposed for viewing from the Williams Gulch travel route. Prescribed burning would be done from upper elevations down to Cougar Gulch road and the Williams Gulch road which act as a fuel break fire line. There would be some risk of skyline corridors creating a strong visible line in the highly textured forested setting. By using a feathering technique, and group selection cutting around the skyline corridors the corridors would blend in more easily. Line, color, and texture will be emphasized, there will be no forms (openings) introduced. Pruning, hand pile and pile burning are techniques that would remain visually subordinate to the existing landscape character.

Alternative 2 revised proposed action would meet the Partial Retention FG and Modification FG/MG as prescribed to William Gulch Viewshed.

Cumulative Effects

This cumulative effects analysis considers effects of past, present, and reasonably foreseeable future actions within the Swauk Pine Project area. The geographic boundary for this cumulative effects analysis is the Swauk Pine Integrated Fuels Reduction Project Area and the temporal boundary is approximately 10 years (the amount of time needed for evidence of logging, restoration activities associated with road management and ecological function to soften and blend into the landscape more completely).

Past Actions

Vegetation management has occurred in the past in the Swauk Pine Integrated Fuels Reduction Project Area, there have been numerous timber sales, fuels reduction treatments, and activities associated with hazard tree removal along travel routes.

Roading, timber harvest, mining, recreation uses and the development of private land has changed the landscape character to a mixture of natural appearing in the forested environment to rural landscape character where private residences.

The activities of past management activities in total combine to maintain a range of scenic integrity levels from very low to high in the designated viewsheds.

Present Actions

Vegetation management will continue to occur as routine hazard tree removal along travel routes. The Forest Service will continue to close roads on USFS lands.

Recreation use will continue to occur as year round activities and increase in the future.

Reasonably Foreseeable Future Actions

A sustainable forest would be promoted, the larger diameter trees (>20”) would be retained and become more healthy as competition from other vegetation species would be reduced. The large trees would have more nutrients, water, and space for growing and would be visually enhanced for viewing along the travel routes. The landscape character will be scenically and ecologically improved as the vegetation patterns become more diverse as a more complex forest structure is established and old growth characteristics become more dominant.

Private development will occur on private lands within the National Forest boundary.

Overall, the trend is that scenic natural appearing landscapes will be more desirable over time in the forested setting.

Consistency Finding

All action alternatives would maintain a range of Moderate to High Landscape Character and Scenic Integrity (Condition) and would meet the established Visual Quality Objectives of Partial Retention or Retention. In areas designated to Partial Retention VQO the visitor would perceive a natural appearing to slightly altered landscape viewed in foreground or middleground and would have moderate scenic integrity. In areas designated to Retention VQO the visitor would perceive a natural appearing landscape viewed in foreground and would have high scenic integrity. The proposed treatments would be consistent with Forest Plan Standards and Guidelines for Visual Quality.

Other Required Disclosures_____

Social Groups, Civil Rights, and Environmental Justice

Civil rights would not be impacted by the Swauk Pine Restoration Project. The project would entail work by various contractors, as well as “force account” work by Forest Service employees. Under Executive Order 11246 companies with Federal, contracts or subcontracts are prohibited from job discrimination on the basis of race, color, religion, sex, or national origin. The US Department of Agriculture prohibits discrimination in its employment practices based on race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital and family status.

Executive Order 12898 (59 Fed. Reg. 7629, 1994) directs Federal agencies to identify and address, as appropriate, any disproportionately high and adverse human health or environmental effects on minority and low-income populations. The project would not affect low income or minority communities. Some contracts for this project may be offered under Small Business Administration authorities, which could result in positive employment benefits to the local community.

The proposed action would not have disparate effects on any consumers, minority groups, women, civil rights, or social/ethnic groups. All contracts would meet Equal Employment Opportunity requirements.

Reserved Indian Rights and Forest Service Trust Responsibility

The Project Area is located on lands ceded to the U.S. government under the 1855 Yakima Treaty. As such, members of the Yakama Indian Nation retain certain rights and privileges, including “the exclusive right to take fish in all streams...; the right to take fish at all usual and accustomed places, in common with the citizens of the Territory, and of erecting temporary houses for curing them, together with; the privilege of hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed land.”. These reserved rights are still exercised by tribal members today under tribal regulations and remain enforceable under the supremacy clause of the U.S. Constitution until extinguished by Congress.

The Swauk Pine Restoration Project would not affect the rights and privileges granted to the Yakama Nation. The planning area is also within the traditional use area of the Confederated Tribes of the Colville Reservation. The project would not affect or preclude their use of the area.

Protection of Floodplains and Wetlands (Executive Orders 11988 and 11990)

The project would not impact nationally mapped wetlands. Project activities would occur in Riparian Reserves, on floodplains, and around small unmapped wetlands, but all of these features would be protected through required mitigation measures designed to ensure consistency with amended Forest Plan standards and guidelines, and Executive Orders 11988 and 11990.

Prime Rangeland, Farmland and Forestland

The Project will not affect prime rangelands, grasslands, or forestlands.

Wild and Scenic Rivers

The Project Area does not encompass and or adjoin Wild and Scenic Rivers.

Inventoried Roadless Areas, Potential Wilderness Areas, and Wilderness Study Areas

The Project entails non-commercial treatment (use of prescribed fire) in the Lion Rock Potential Wilderness Area (PWA) (436 ac) and the Lion Rock Inventoried Roadless Area (IRA) (29 ac). It will not affect Wilderness Study Areas, or any other large unroaded areas.

Treatments in PWA and IRA are needed to meet a landscape level restoration objective (maintain open forest conditions in historically open stands on drier sites. No road construction is planned and the only tree removal would be incidental felling of small trees to augment natural firelines. All cut trees would remain on site. Treatments would not affect unroaded character or eligibility for wilderness consideration.

A proposed restoration action in PWA is decommissioning of unauthorized roads. This action would slightly improve its unroaded character, however, nearby non-system roads (public rights-of-way) would remain on the landscape,

Energy Requirements and Conservation Potential

In regard to national and global petroleum reserves, the energy consumption associated with this project would be insignificant.

Climate Change

The scale of treatments under the Swauk Pine Restoration Project would not affect climate or the trajectory of climate change. Treatments would move forest conditions in the Project Area closer to their historic conditions, and restore the area's inherent mixed severity fire regime. The historic landscape was more ecologically resilient. This project is designed to improve the ecological resilience of current landscape, in the face of climate change.

Irreversible and Irretrievable Commitment of Resources

An irreversible commitment of resources cannot be regained, such as extinction of a species or the removal of mined ore. An irretrievable commitment is one that can potentially be regained, such as the temporary loss of timber productivity in a power line corridor. There are no known substantial irreversible or irretrievable commitments of resources that would result from the Swauk Pine Project. Fossil fuels used during the timber harvest and burning operations would be irretrievably lost, but the amount would be insignificant at local, regional and national scales.

Human Health and Safety

The project would entail use of herbicides, in accordance with the 2005 Invasives ROD. An herbicide use and transportation plan would be prepared. With planned mitigations, the likelihood of exposure to herbicides for Forest workers and the public is low, and the consequences of exposure would be minor.

Scientific Uncertainty

There are no scientific uncertainties surrounding the effects analyses presented in this EA. The identified risks from proposed treatments are not unique or unprecedented, and planned mitigation measures in response to these risks have been widely implemented across the Forest, and are known to be effective.

Compliance with Laws, Regulations, and other Executive Orders

NEPA at 40 CFR 1502.25(a) states "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with other environmental review laws and executive orders." Laws and executive orders were considered in this analysis, as follows:

Endangered Species Act

The Forest Service is preparing a Biological Assessment (BA) of the Proposed Action's effects on federally listed wildlife. The project would result in short-term adverse effects to the northern spotted owl and its designated critical habitat, requiring formal section 7 consultation with the U.S. Fish and Wildlife Service (FWS). FWS was consulted about the project during the earliest stages of planning, particularly in regard to the Final Revised Recovery Plan for the Northern Spotted Owl.

The project would / would not affect federally listed fish or essential fish habitat, and would not affect federally listed plants; therefore no other consultation was required.

National Historic Preservation Act

The Forest Service completed field surveys for cultural resources in proposed treatment areas, and submitted its findings to the Washington State Historic Preservation Office (SHPO). With planned mitigations, no sites eligible for historic protection would be affected by the Swauk Pine Restoration Project. SHPO concurred with these findings in a letter dated x.

Clean Water Act

Best Management Practices have been incorporated into project design to reduce risk of surface erosion and runoff from proposed logging and burning operations and road actions, including construction, use, and obliteration of temporary roads. The project is consistent with the Clean Water Act.

Clean Air Act

Proposed burning would produce emissions that potentially affect air quality outside of Class I airsheds, but the project has been designed to minimize air emission. Harvest activity would entail whole tree yarding that reduces the amount of activity fuel that would need to be burned. Prescribed burns would be designed to minimize smoke accumulation in populated areas, and would comply with the Smoke Management Plan for Washington State, as administered by the Department of Natural Resources. Over the long-term, proposed treatments would reduce fuel loads in this Project Area, and restore the natural role of fire in this ecosystem. The risk of uncharacteristic wildlife (and future emissions) would be reduced. The project is consistent with the Clean Air,

National Forest Management Act (NFMA)

Pursuant to NFMA, the project would incorporate mitigations that ensure compliance with amended Forest Plan standards and guidelines. Viability for wildlife and fish is ensured by consistency with Forest Plan standards and / or approved Recovery Plans for federally listed species. The project is consistent with NFMA

Forest Service Roadless Conservation Rule (USDA 2000)

The Project entails non-commercial treatments in an Inventoried Roadless Area, for the purposes of ecological restoration. It would not affect unroaded character or eligibility for wilderness consideration. The project is consistent with the Roadless Conservation Rule.

Migratory Bird Treaty Act and Executive Order 13186 – Protection of Migratory Landbirds

The project would restore open late successional forest structure dominated by large old ponderosa pine, a priority habitat for landbird conservation. Although fall burning is preferred, proposed spring burning may result in unintended take of ground-nesting landbirds. Any short-term impacts from spring burning on landbirds are outweighed by the benefits of proposed treatments (restoration of a priority habitat, restoration of dense patches of snags to the landscape, and reduced risk of uncharacteristic fire behavior likely to affect many more birds over a much larger area). Therefore the project is consistent with the Migratory Bird Treaty Act and Executive Order 13186 for the Protection of Migratory Landbirds.

Executive Order 13112 (Invasive Species) and the Federal Noxious Weed Control Act of 1974 (as amended)

The project includes required mitigations and best management practices that would minimize risk of weed establishment and spread, and also includes provisions for monitoring and treating invasive plants in accordance with the 2005 Invasives ROD. It is therefore consistent with the Executive Order and federal law pertaining to management of invasive plants.

CHAPTER 4 - CONSULTATION AND COORDINATION

CURRENT INTERDISCIPLINARY TEAM MEMBERS:

John Agar, Silviculturist and Interdisciplinary Team Leader

KC Briggs, Fisheries Biologist

Michelle Capp, District Ranger

Luke Cerise, Soils Scientist

William Ehinger, Hydrologist

Kelly Evans, Botanist

Barbara Jackson, Landscape Architect

Shan Madden, Logging Systems and Cultural Resource Specialist

David McCormack, Roads and Engineering

Cindy Raekes, Fisheries Biologist

Pam Novitzky, Recreation Specialist

Jo Richards, Environmental Coordinator / Wildlife Biologist

Mike Starkovich, Fire Management Officer

Chaochung Tsai, GIS Specialist

Aja Woodrow, Wildlife Biologist

The Forest Service consulted the following tribal governments and agencies during project planning:

AMERICAN INDIAN TRIBES:

- Yakama Nation
- Confederated Tribes of the Colville Reservation

FEDERAL, STATE, AND LOCAL AGENCIES:

- United States Fish and Wildlife Service, Wenatchee Office
- National Marine Fisheries Service, Ellensburg Office
- Washington State Office of Historic Protection, Olympia Office
- Washington Department of Fish and Wildlife, Yakima Office
- Washington Department of Natural Resources, Ellensburg Office